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Steam and Electricity have changed the commerce not only; they have revolutionized also the governments of the world. They have given to the press its power and brought all races into touch and sympathy. They have tested and are trying the strength of all systems to stand the strain and conform to the conditions which follow the germinating influences of American democracy.—CHAUNCEY M. DEPEW'S CENTENNIAL ORATION.

OUR NEW QUARTERS.

In accordance with recent announcement, the offices of THE ELECTRICAL WORLD have been removed from the Potter Building to the new Times Building, which may be briefly described as New York's loftiest and most beautiful commercial edifice. The new offices of our paper are on the ninth floor, and front on the Post-Office, Park row, City Hall Park, Printing House Square and Nassau street. The suite comprises eleven large rooms, consisting of president's room, correspondence department, business department, treasurer's room, library, editorial departments, advertising department, draughting room, patent department and patent library. In addition to this provision for the publication of the paper and the conduct of the rapidly growing business, three large offices have also been taken in the building of the American Tract Society, adjoining on Nassau street, for mailing, filing and storage purposes.

Now that we are settled in our new quarters, we shall be glad to see all our old friends and to make them at home, for the offices have been secured and fitted up as much for their comfort and enjoyment as for ours. We expect every reader or advertiser visiting New York to call upon us and to use the offices as if they were his own; and if he cannot come, we want him to understand that we are better equipped than ever to do him service and to give him a paper worthy of his perusal and of the great science and industry that it aims to represent.

The American Institute of Electrical Engineers.

WE publish this week the programme for the annual meeting of the American Institute of Electrical Engineers, which will be held in this city on May 21 and 22. It will be seen that in the number, variety and timeliness of the papers, as well as in the scientific standing of the authors, there is promise of the best meeting the Institute has ever had, worthily marking the beginning of its sixth year.

A Promise of Cheaper Copper.

ACCORDING to the latest dispatches from Europe, the conference in Paris of copper magnates has proved a failure. "The American committee have left Paris in disgust, and copper will be put on the open market and sold for what it will bring." It is said that the amount of copper that has been tied up and held in pledge for money advances, is no less a quantity than 175,000 tons. The effect of throwing so much on the market can be readily imagined. Though it is hard to believe that the 175,000 tons will all be poured out at once from the places of storage, copper must evidently be cheaper, and herein is comfort for the industries that have been cornered.

Centennial Days.

IT was a proud thing to be a New Yorker the past week, and to take part in the ceremonies and rejoicings with which the Republic entered upon its second century of national life. But the celebration was participated in as well by millions throughout the land as by the inhabitants of the city and their hundreds of thousands of visitors; and this is one of the most notable features of the occasion. A hundred years ago, with few roads, no railways or steamboats, a bad postal service and no telegraphs, the forces for disunion were strong. To-day, with multiplied means of travel, and with the telegraph and telephone for quick intercommunication, the forebodings as to continued union, that weighed down many anxious minds, are well nigh dissipated. The dangers do not lie that way. Our country has but one heart throb, one national sentiment, one patriotic voice. There has been a great deal said of late about the success of the American democratic experiment and the wisdom embodied in the Constitution, but Mr. Depew was discerning when in his discussion of principles and causes he touched upon the influence of steam and electricity. They two are the profoundly democratic agencies of the age. Prince Bismarck dislikes the telegraph, China objects to the railway; but in America we love and foster the things that make for community of interest and the good of all.

An Uninteresting Job.

THE removal of poles and wires up town in New York still goes on, but as one of the papers remarks with unintentional significance, "the work has lost much of its interest." As far as we have been able to find out it never did interest the public very greatly, but, on the contrary, there has during these Centennial days been a growing spirit of disapproval of the Mayor's actions, which, like his late appointments to office, smack of "personal policy," and in some quarters are supposed to have good personal reasons behind them. We must confess our pleasure at seeing some of the old poles disappear that were sheer ugly and rotten wrecks; but of the ruthless destruction as a whole, including beautiful pole lines in wide streets, lines that were comelier and truer built than the houses they passed, we have nothing but words and feelings of condemnation; and we believe that the Mayor himself will be sorry by and by for thus wiping out of existence so much property that subserved public safety and convenience. It is not a little striking that just as the Mayor of New York should thus chop down poles right and left, and right or wrong, the city of Boston should have granted powers for the construction of hundreds of miles of pole lines and wires for electric railway work. Yet if there be any city in this country with an appreciation of improvement, and a sense of æsthetic propriety, it is Boston.

Overhead Wires for Boston.

WE called attention recently to the situation of affairs in Boston, where the West End Railroad asked for permission to put up an overhead system throughout the city for the operation of its cars by electricity. The pros and cons of the case were freely discussed, as our columns showed, and the taking of opinions and evidence was followed up by an investigation of the operation of electric roads in various parts of the country. This week we record the fact that the Board of Aldermen of Boston have unanimously granted permission to the West End Company to construct and operate an overhead single trolley system in the streets and squares where its tracks are now located and to make such surface and underground alterations as may be necessary. This means practically that Boston is to have, sooner or later, three or four hundred miles of trolley electric roads, and while opposition may be expected from some citizens, it is certain that much of the work will be done at once, and that the electric service will grow in favor with the public, already so enthusiastic about it. When we remember how willingly New Yorkers put up with the nuisances and annoyances of the elevated roads, with their countless heavy iron posts and girders, it may well be believed that for the sake of rapid transit Bostonians will accept the overhead system, wanting as it is in almost every one of the objectionable features that attach to the use of steam locomotion in large cities.

The Electric Light Industry.

THE figures presented so modestly before the Beacon Society by Mr. C. A. Coffin, as quoted in our columns this week, of the growth in electric lighting, especially under the system he represented, speak volumes for the stability, permanency and steady earning capacity of the industry. When we recall the early struggles and vicissitudes of local electric light companies, beset by prejudice, conservatism, ignorance and active competition, and when we recall, too, the fact that the system in question was practically introduced after the field had been well covered by great and wealthy rivals, the record of prosperity of the 500 Thomson-Houston companies is certainly most remarkable and pleasing. The figures that were given also as to the Edison incandescent business, at the same meeting, were a fine exhibition of deep-rooted, broad-based success. As we have been reading over these statistics, the thought has struck us that perhaps the personnel of these local companies, under all the various systems, has been in many respects an excellent element in contributing to so grand a development. To say nothing of the men interested once or now in the parent companies, it may be claimed with truth that in the local managements and ownerships will be found some of the very best and brightest of the business men and professional men of the community. Take New York, or Philadelphia, or Chicago or Kansas City, and see who control the companies, and it will be found at once that they are among the foremost spirits of each city; and while this is the case in the large centres of population, it is equally so in all our towns and villages. In fact, electric lighting to day has as much brain power, money power and inventive power behind it as any industry in America, and, indeed, for attractiveness to these elements of progress is matched only by the electric railway industry, the youthful vigor of which well nigh surpasses credibility.

City Electric Light Plants.

A SHORT time ago we noted the agitation that had arisen in Massachusetts over the question whether Danvers, a town in that State, should do an electric lighting business or not; and we pointed out how wide a range of problems that little dispute involved. Judging from a Boston letter in the *Evening Post*, our view of the case chimes in with that of some other people, since it is stated by the correspondent that the movement for the municipal control of industries, to which the odd name of "Nationalism" has been given, is likely to become an important political factor. The idea of "nationalism," which undoubtedly ought to be called "municipalism," is that any municipality should engage in and monopolize any industry it cares to, and the fundamental principle is thus laid down by Mr. Arthur Hildreth: "The right of eminent domain, the right of the people to take private property for public uses, is part of the fundamental law of the land, and this is nationalism. When the founders of our nation put in the Constitution a clause allowing Government to establish post-offices and drive out private companies, this was nationalism. When their children took commons, parks, roads, bridges, schools, libraries, and put them into the hands of the Government, this was nationalism. When our fathers gave the aqueducts to the cities, this was nationalism. When we, their children, ask that gas and electricity be given to the towns, this is nationalism." Mr. Hildreth might well have added that this is Socialism, too. It is always desirable to see how far a principle or tendency may carry us; and it is now plain that it would be scarcely possible to stop short at buying up or starting gas works and electric light plants. The street railways would go next, and then, perhaps, the ferry boats and the peanut stands. Some day New York city, for example, may see Alderman Romeo moving that the salaries of his constituents, the city peanut vendors, be increased ten per cent., while Alderman Kartoffel will jump from his seat with indignation to threaten that unless the board raises the wages of the city's sauerkraut makers twenty-five per cent. there will be riot and bloodshed. Who will deny that peanuts and sauerkraut are among the first necessities of life to large numbers of our people? And that being so, we cannot give in our adhesion to "Nationalism" unless they are embraced in its programme or bill of fare.

"ELECTRICAL WORLD" PORTRAITS.—V.

GEORGE A. HAMILTON.

The subject of the present sketch is well qualified to represent the telegraphic profession in America, not only on account of his long and distinguished connection with the Western Union Telegraph Company, whose electrician he was until recently, but because of the manner in which, like other "old time" operators, among whom may be mentioned T. A. Edison, P. B. Delany, F. L. Pope, T. D. Lockwood and Gerritt Smith, as well as many more, he fought his own way up from the key to well assured technical position and reputation. Men are now rising into eminence in electrical science and industry in this country who have never had the remotest connection with telegraphy, but it is the fact that but a few years ago there was not a single well-known electrician in the front rank who was without telegraphic affiliations, or had not himself, in pursuit of a livelihood, mastered the mysteries of the Morse alphabet and of the operating room. These early telegraphers constitute a class, almost a school, by themselves, and it will always be to their glory and credit that as pioneers they did so much to give electricity in America its high standing and an enormous extension altogether unparalleled in any other part of the world.

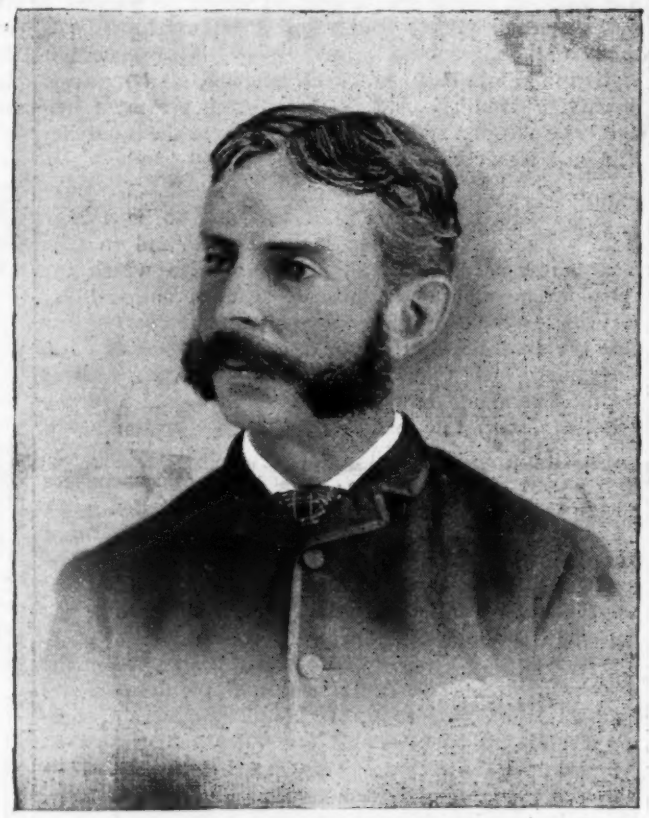
Mr. George A. Hamilton was born at Cleveland, O., on December 30, 1843. As a mere boy he showed great interest in electricity, and built a telegraph line on a modest scale at Limaville, O., setting up the poles, fixing the insulators, rigging up a turning lathe and making his own apparatus. This episode practically determined his career, as in 1861 he became a messenger at Salem, O., and two months later manager of the office at Ravenna, O., of the Atlantic & Great Western Railroad, the line having been but just completed to that point. At Ravenna he remained until July, 1863, when an attack of typhoid fever forced him to leave. Upon his recovery he went to Pittsburgh, Pa., where he remained until 1865 as operator and manager in the office of the Inland Company. While in the "Smoky City," he enjoyed the novel experience of being arrested in 1864 with other officials of the Insulated and Inland companies, and being taken to the old Capitol at Washington, for his innocent participation in the work of circulating Mr. Joseph Howard's extraordinary bogus Lincoln proclamation.

In 1865 Mr. Hamilton went to Franklin, O., as manager of the United States Telegraph office. He was soon after transferred to Meadville, Pa., in the same employ, but in 1866 he was summarily relieved by Superintendent Fitch, who fancied that the ambitious young man was about to engage with another company. He thereupon returned to Pittsburgh in the spring of 1867 and remained with that company as chief operator and circuit manager until after its absorption by the aggressive and growing Western Union in 1873. An opportunity for experimental work now presented itself that was eagerly seized, and Mr. Hamilton in the same year became an assistant to Prof. Moses G. Farmer, in Boston, in the manufacture of general electrical apparatus and machinery. He thus gained a good practical knowledge of mechanics, and was enabled to take part in many important experiments and investigations carried on by Prof. Farmer, not only in telegraphy, but in the newer branches of electrical engineering.

Mr. Hamilton's success in this department of work soon attracted attention, and in July, 1875, he was called to New York to assume the responsible duties of assistant electrician to the Western Union Company. Much of his time during the first two years of service was spent, in conjunction with Mr. Gerritt Smith, in establishing and maintaining the first quadruplex circuits. He was also appointed chief electrician of the repair expedition of the Key West-Havana cables in 1876, on board the steamship "Prof. Morse," and in that capacity visited Cuba. In 1877, associated with Mr. Gerritt Smith, he had the honor of establishing the first quadruplex circuit in England, and shortly after his return he conducted the experiments at the Chicago end preliminary to the establishment of the Wheatstone automatic system in this country

Of late years, in the course of his duties, Mr. Hamilton has introduced a number of improvements in connection with the service of the Western Union Company, and upon some of them has secured patents. He has, however, tired a little of the monotony of the work, which, from its very nature, gave but slight scope for inventive or constructive genius. A few months ago, therefore, the telegraphic world was surprised to hear that Mr. Hamilton had resigned his post with the Western Union Company and joined the forces of the Western Electric Company, in response to a very flattering invitation from the latter quarter. It is understood to be the intention of the Western Electric Company to organize at its immense new factory in this city a department devoted to the production of fine electrical instruments, and the work has been intrusted to Mr. Hamilton's care and supervision. It must seem a pity to many that Mr. Hamilton should leave a corporation of the first rank, and of national importance, to whose upbuilding he had notably contributed; but there can be no question that in his new sphere of labor he will, under auspices even more encouraging, be able to give free play to his tastes and abilities.

Mr. Hamilton, it may be added, is a charter member of the American Institute of Electrical Engineers, and was on its committee of organization. He served as vice-president in 1884 and 1885, then became chairman of the Board of Examiners, and is now chairman of the Editing Committee. He is also a member of the Institution of Electrical Engineers of England and of the Société Internationale des Electriciens of France.



GEORGE A. HAMILTON.

Short Notes for Beginners in the Electrical Supply Trade.—III.

BY FRED. DE LAND.

Medical Batteries.

For general family use the most salable battery on the market to-day is one that is manufactured in the East, and retails for about eight dollars. It is handsomely finished, easily kept in order, is maintained at almost no expense, and is always ready for use.

It will not be found profitable to carry more than two styles or sizes of medical batteries in stock, as the sale of this class of goods depends largely on the ability of the salesman, who should take pride in posting himself on the physiological effects of the different currents. This really necessary information can be readily obtained by a thorough reading of either one of three recent works on medical electricity, and such perusal will be of further value in making the salesman cautious in recommending the use of electricity in treating many diseases, and will teach him that it is better to lose an occasional sale by referring the customer to a competent physician rather than aid in aggravating what may prove to be an organic trouble. Like nux vomica and other alkaloids, electricity is a remedial agency of such potency that it should ordinarily be used only under proper medical supervision. Fortunately there is no more virtue in the ordinary medical battery than in the average bottle of patent medicine. Yet each is equally efficacious in driving away the imaginary ills of deluded mortals.

A certain class of laboring men can most quickly be pleased with a small but powerful coil, having suitable handles and cords, coupled to an open circuit cell. This combination will afford just what they desire, a series of severe "shocks," which, taken with their faith, will cure touches of malaria that with many people would require several strong doses of quinine.

These coils can be manufactured in lots of fifty at a price that will yield a handsome profit when the coil and cell of battery are sold for about four dollars; in fact, the trade in medical batteries can always be made a profitable one, and they should be a prominent feature in show case and window. Extra handles and sponge electrodes should be carried in stock, but other electrodes will have slow sale, being used almost solely by physicians who purchase them direct from the manufacturers.

While a small amount of business can be transacted in supplying to local physicians a set of thirty or fifty cells of a standard open circuit battery connected to a proper switch-board, and intended for office use, yet it is doubtful if such sales prove profitable unless it is understood beforehand that all visits made by workmen and material used after proper installation are to be paid for at regular rates.

Chemicals for medical batteries should be kept on hand in neat packages and their sale encouraged. Each package should have a label bearing the name of the article, and, in the case of acids, a few cautionary remarks, as well as the address of the house. While this may entail a trifle extra expense, the gain in the good impression created and the continued advertisement given offsets all cost.

Chromic acid is generally imported in tin cans of various sizes, the smaller being five and ten pounds, respectively. The latter is the most economical to retail from, but unless supplied with a tight cover and kept free from atmospheric action, deliquescence will ensue. It will prove both convenient and profitable to empty a tin holding about one hundred pounds into small cans holding six and twelve ounces, nicely labelled and wrapped, to retail at 25 and 40 cents, respectively.

Bichromate of potassium, powdered, should be kept in double-wrapped packages of a quarter and half pounds. Ounce vials is the most convenient form for sulphate of zinc and bi-sulphate of mercury. Dilute sulphuric acid in half and one pound bottles, labelled and wrapped, will find a fair sale. A large jug of battery fluid should always be kept on hand.

The profit in all these goods is no more than was obtained for druggists' sundries before "Macy" in New York slaughtered prices.

Primary Batteries for Incandescent Lighting.

Primary batteries for incandescent lighting will oftentimes be called for, and the dealer will frequently be tempted to follow in the footsteps of capitalists who have been inveigled into investing thousands of dollars in what the inventor claimed was "an entirely new, reliable and economical generator of electrical energy, particularly suitable for use in household illumination," but which proved to be simple modifications of the Bunsen type. Such investments have not proved particularly gratifying, except it be in the exchange of the inventor's experience for the investor's capital.

When batteries are desired for illuminating or motor work, it is better to explain to the customer that as a given amount of coal will produce a known quantity of heat, so likewise certain chemicals when placed in a properly constructed cell will yield known results that are easily determined beforehand; that metallic zinc is the principal positive element in all these batteries, and holds the relative position in a cell that coal does in a furnace; that to produce each electrical horse power hour of energy requires 1¼ pounds of zinc, about an equal amount of chromic acid or similar depolarizer, and a quantity of diluted acid, altogether costing at wholesale rates fifty cents, to say nothing about the labor, capital invested, or depreciation in the cells, and that the amount of light that can be obtained will seldom exceed ten 16-candle power lamps per horse power.

In other words, it will cost the customer using primary batteries and burning 10 incandescent lamps four hours each evening five cents per lamp per hour, or a total cost of $2 for the evening's light.

While such an explanation may not increase the sales so far as primary batteries are concerned, it will be valuable in winning the respect and confidence of customers, which is more to be desired than silver or gold.

A Power Station at Rheinfelden.

The three large Swiss firms of Zschokke & Co., Escher, Wyss & Co., and Brown, of Oerlikon, have, says *l'Electricien*, been studying the question of the establishment of a station at Rheinfelden for the distribution of power by electricity. The preliminary surveys have been made, the plans are already drawn up, and a concession from the government of the Grand Duchy of Baden is now being applied for. The village of Rheinfelden is situated on the Rhine, about 15 kilometres from Basle, and the promoters estimate that about 15.000 horse-power will be available if modern hydraulic plant is installed. It is proposed to erect twenty 750 horse-power vertical turbines, coupled direct to as many 500,000 watt dynamos, giving 2,000 volts and 250 ampères. Several dynamos will be connected in series, and a series system of distribution will be employed.

Locating Submerged Metals.

To the Editor of the Electrical World:

SIR: Will you kindly say whether there is any marine electrical apparatus to be used by marine wrecking crews to enable them to locate wrecks, iron ore, anchors, etc., from the surface? We have been informed that there is such a mechanism. If you can give us a description or the names of the makers, or information regarding it, we will greatly appreciate it. W. F. DAVIDSON.

PORT HURON, Mich.

ANSWER.—An instrument designed for the purpose above described has been constructed by Capt. McEvoy of the English torpedo service, and is known as McEvoy's "Submarine Detector." It is based on the principle of the Hughes induction balance. This instrument is described in a number of electrical works, among others in Hospitalier's "Modern Applications of Electricity." The apparatus is simple and can be constructed by any good electro-mechanician.—EDS. E. W.

The Gaynor Fire Alarm System.

For some time past the Gaynor Electric Company, of Louisville, Ky., has been at work on the elaboration of a complete fire alarm system, and this has recently been brought to such perfection that the company feels justified in placing it before the public. The company has erected a large factory, consisting of a building 180 feet long and five stories high, and equipped with all modern machinery for manufacturing on the modern principle of interchangeability of parts.

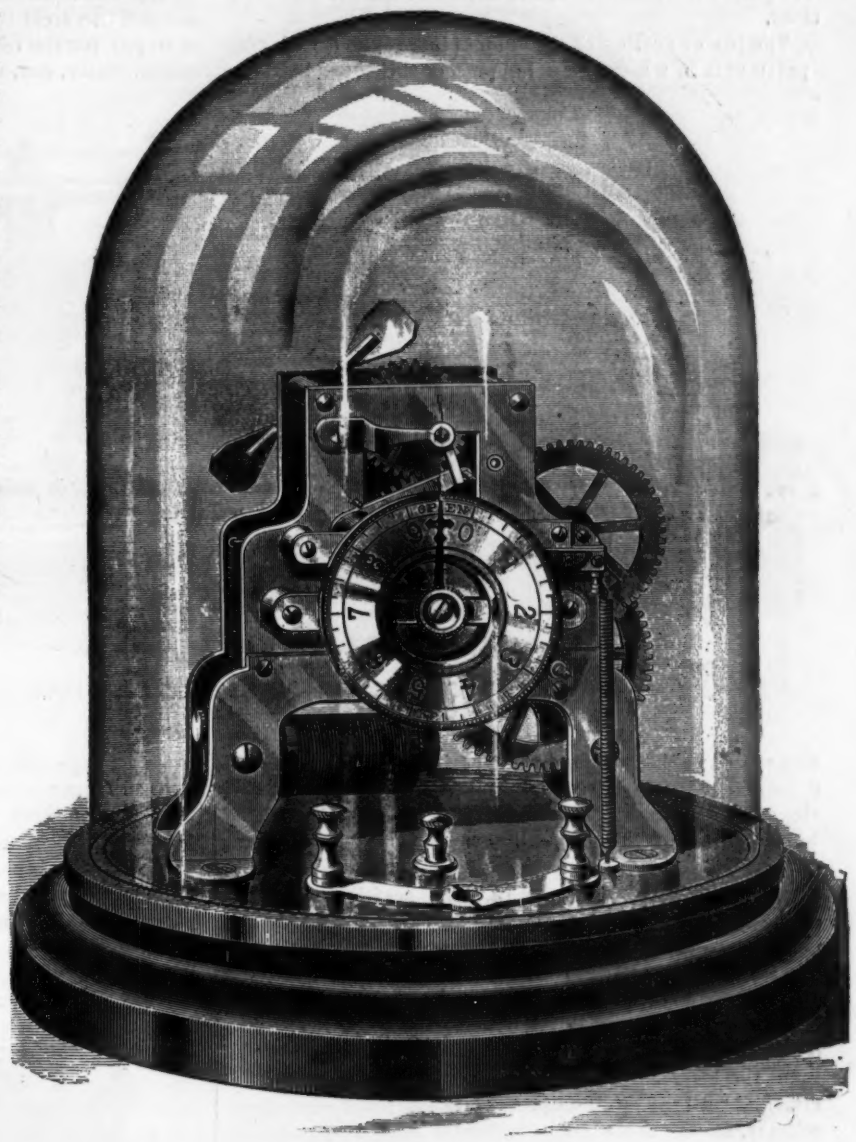
The system itself is very simple and has been very well worked out in all its details. Thus, beginning from the point which interests the public most—the street fire alarm box—our illustration, Fig. 1, shows the box with both doors open. In the ordinary systems the door of the box first requires to be opened and a hook pulled down, by which the signal is afterwards transmitted. In the Gaynor system the key, when inserted in the lock and turned, instantly sets the mechanism into action, signaling the box number to the different receiving devices. In this way all confusion on the part of those sending the signals is avoided.

There are two kinds of keys provided for opening these boxes, one the "citizen's" key, which sends in the signal when the lid is opened, and which can only be released by the "release" key, which is carried by the chief alone. The lineman, however, is provided with a special key, by which he can unlock and lock the box without having his key trapped or tripping the mechanism into action. The novel feature of these keys consists in the fact that the barrel of the key is hollow throughout its entire length, by which the accumulation of dust, which might interfere with its proper action, is prevented.

Referring to Fig. 1, it will be seen that the instant the detent lever, shown just below the round movement case, is pressed downward, the whole mechanism is set in operation, the bell is automatically cut into circuit, ringing its box number, so that the person giving the alarm may know that it is properly acting; the circuit wheel revolves and thereby transmits the number of the box four times in rapid succession; at the same time the spring tension indicator turns, showing that another alarm has been sent in from that box, and the detent lever resets itself, and in doing so shunts the bell. Thus the box is again ready for its work. The train runs rapidly, consuming but little time in accurately transmitting to the department the box number. The figures on the dial, by their coincidence with the index, always show the exact number of the alarms that have been sent in. When, therefore, the index does not point to zero, it is the lineman's duty to wind it to that position. By the attachment of the stem-winding device, the lineman is relieved of the necessity of carrying another key.

The box also contains a combined switch and lightning arrester, which is clearly shown. The vertical position of the index indicates that the box is in circuit, the pointer being at the words "box in." When the pointer is on the words "box out," it indicates that the box is out of circuit, the main line being closed. The "box out" indication is made when it is desired to examine or manipulate the box mechanism locally without interfering with the main line or other circuits. When the index is thrown horizontally to the right or left, it shows that the line is grounded on the right or left of the box, as the case may be. This connection is made when the circuit is to be tested for grounds, or when any break in the line is to be overcome by creating a ground between the two boxes on each side of the broken part of the circuit. During storms, or at night, if the main line should be broken, it is very important to establish a complete circuit for the boxes as soon as possible, regardless of the break, and to maintain the same until the break can be discovered and corrected, all of which is made possible by the use of this switch.

The bottom plate has a ground connection forming a lightning arrester to carry atmospheric electricity from the lines to the ground.



FIGS. 1 AND 4.—STREET BOX AND DURAMETER, GAYNOR FIRE ALARM SYSTEM.

The box also contains a novel "signal circuit breaker" or key. The circuit is closed by contact of the vertical pin against the cone, the cone being forcibly impinged against the pin by the spiral spring shown. A new and clean contact is had by revolving the key. The act of pushing the button inwardly breaks the contact and gives the signals when it is desired to use this device as a telegraph key. By the use of this key the contact point can be cleaned without breaking the circuit, evidently a valuable feature in such a system.

The central office apparatus generally used in connection with the Gaynor system is shown in Fig. 2. It is made in a graceful design and arranged so as to have the whole concentrated in a small space. When an alarm box is put in action it operates the register shown at the left hand side of the cabinet. Directly above this is the gong, while at the right side the indicator is shown. In the centre is placed the automatic repeater, shown enlarged in Fig. 3, above which is the dial of the manual repeater.

Above the manual repeater is placed a call annunciator with vibrating bell. Each circuit in the system passes through a separate drop, and as a result, when the alarm is turned in, or in case of accidental interference with any of the circuits, the fact is at once made manifest by the fall of the drop number of the circuit thus acted upon.

The switch-boards shown in the panels of the cabinet are most compact and complete. All of the line and battery wires radiate from them and any test or change of connection can be made without requiring the attendant to go to the battery room or elsewhere.

At the lower part of the switch-board, terminal wires are provided with ground and test keys, to be used in testing the circuits. It is only necessary to press the key upon the ground bar shown beneath the buttons. Should a

ground exist it is at once indicated by the deflection of the galvanometer needle. The galvanometers are placed below each switch-board, and are normally in circuit, so that the intensity of the line circuits and the condition of the batteries are indicated at all times. Above the switch-boards are placed the numbers and locations of the fire alarm stations.

The lower portion of the cabinet is provided with compartments in which may be placed the local batteries.

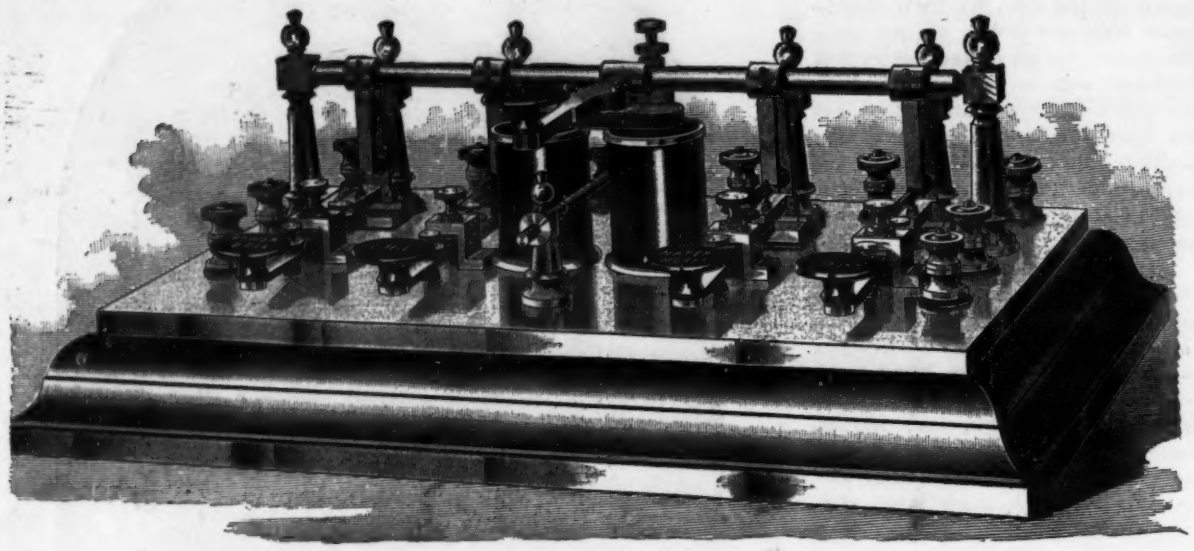


FIG. 3.—AUTOMATIC REPEATER, GAYNOR FIRE ALARM SYSTEM.

The whole cabinet is mounted on friction casters, so that it may be moved around, giving access to the wire connections at its back. The cabinet is made of seasoned hard wood, and is artistically ornamented with carvings appropriate for a fire department.

When an alarm is "turned in," the register on the left of the cabinet prints the number of the box upon the paper tape, to be quickly read by the person in charge. At the same time the dial on the indicator at the right hand shows in plain figures the number of the box operated, while the gong simultaneously sounds the number in suitable strokes, all of which indicate to the department the location of the station from which the alarm is given. At all the engine houses in the city the same operation is, at the same time, instantly and automatically duplicated upon such of these instruments as are located therein.

While the members of the department are hitching up their apparatus, the man in charge, or one of their number, sets the index hand on the dial of the manual repeater to the number of the box-signal received, thus repeating the signals to all tower bell-strikers, gongs, tappers, etc., which may be in the alarm circuit. A general alarm of four rounds is sounded automatically on the bells and alarm mechanism in the city. A suitable device attached to the repeater is so connected with the signal mechanism that, should another alarm come with no one there to receive it, the box will automatically operate the alarm apparatus.

Fig. 4 shows the "durameter," situated below the indicator, and which automatically locks and unlocks the door of the combination fire and police box after a given interval.

The system has evidently been worked out with great ability, and is, we understand, already in operation in a number of cities. Its many merits must be obvious to all practically interested in fire department operations.

The Thomson-Houston Electric Road in Boston.

Those in whose mind there still lingers some doubt as to the reliability of the electric railway, will find in the following report of the Cambridge division of the West End Street Railway, Boston, figures that prove conclusively that the electric railway can be depended upon. This road has a previous record of but nine trips lost out of 1,179.

The following report is for the month of April:

Average number of motors in daily service	8
Round trips of motor cars	2,720
Time in service motor, cars	3,232 hours.
Mileage of motor cars	17,680 miles.
Round trips, one tow car	2,720
Round trips, two tow cars	226
Time in service, towed cars	3,500 hours 30 min.
Mileage of towed cars	19,149 miles.
Total car round trips	5 666
Total car mileage	36,829 miles.

Of the above round trips but 7 were lost.

The Electric Light at the Paris Exhibition.

M. Hippolyte Fontaine has read a paper on this subject at a recent meeting of the International Society of Electricians in Paris, from which *Industries* extracts the following particulars. The total cost of the Exhibition to the French Government and city of Paris is estimated at about £2,000,000. There are, in round numbers, 50,000 exhibitors, of whom each will spend on an average £120, representing an additional outlay of £6,000,000, so that the whole cost of the Exhibition may be roughly estimated at £8,000,000. The total earning capacity of exhibitions depends, amongst other things, upon the number of hours during which the public has access. If no artificial lighting were used, the total number of hours would amount to 1,620; but by the adoption of the electric light, this number has been increased to 2,520, reducing the cost of the exhibition per hour from nearly £5,000 to a little over £3,000. Although this is a substantial gain wholly due to electric lighting, the Administration have not cared to erect the necessary plant at their own cost, or to pay for the light at a fixed rate, as they do with steam, water, gas, etc.; but they have agreed to hand over to the purveyor of the light one-half the entrance money received from visitors in the evening, and which is fixed at 2 francs on week days and 1 franc on Sundays. The electric lighting plant has been provided and will be worked by the Electric Lighting Syndicate, which has been formed with a view to make the lighting an international undertaking. The lighting has been divided between a number of firms and systems, and this will afford an excellent opportunity for comparisons. The machinery hall, which has a floor space of 77,000 square metres (or about 19 English acres) and a volume of 2,000,000 cubic metres, will be lighted by arc lamps of various sizes. The largest lamps are those arranged in four groups of twelve lamps close under the ridge of the roof. These will be 60 ampère lamps, and will burn 25 mm. carbons. Of the remaining lamps eighty-six are 25 ampère lamps distributed in five longitudinal rows, and suspended about 15 m. from the floor. The side galleries of the machinery hall and the stands adjacent to them will be lighted by 276 8 ampère arc lamps suspended 5 m. from the floor. The lighting is being undertaken by the following contractors:

FOR THE 25 AMPERE LAMPS,

Crompton & Co	24
Maison Ducommun	20
Sautter, Lemonnier & Co	12
Jaspar	11
Société Belge	6
Borssat	5
Société Française de Materiel Agricole	4
Henrion	4

FOR THE 8 AMPERE ARC LAMPS.

Crompton & Co	79
Maison Ducommun	76
Sautter, Lemonnier & Co	30
Alioth & Co	30
Oerlikon Works	25
Société Française de Materiel Agricole	8
Société Belge	8
Henrion	8
Jaspar	7
Popp & Co	5

In addition to the arc lamps, there will be various installations of lamps, contracted for by the following firms:

Woodhouse & Rawson	8 of 200 c. p.
Garnot	10 " 250 c. p.
Jarriant	360 " 8 c. p.
Crompton	100 " 8 c. p.

The annex devoted to railway exhibits, which comprises nearly 6,000 square metres of surface, is to be lighted by five 25 ampère and thirty 8 ampère arc lamps by M. Borssat, while the large central dome will be lighted by the Société Gramme by forty-eight glow lamps of 500 c. p. Besides the spaces here mentioned, the various other annexes and courts will receive separate installations, but want of space precludes our giving a full list. In the open spaces the lighting will principally be effected by continuous current arc lamps and Jablochkoff candles, and the work is divided between the Paris Edison Company, the Rothschild-Marcel-Deprez combination, the Maison Ducommun, and the Société l'Eclairage Electrique, who work the Jablochkoff system. The large fountain which is being erected by Messrs. Galloway, of Manchester, in conjunction with the administration, will be lighted by the Gramme Company, of Paris, with forty-eight arc lamps, requiring about 250 h. p. There will, however, be a second fountain erected by Messrs. Galloway, who are for this purpose utilizing the plant which was in use at the Manchester Exhibition, and this fountain will be lighted by eighteen 60 ampère arc lamps. M.

FIG. 2.—CENTRAL OFFICE APPARATUS, GAYNOR FIRE ALARM SYSTEM.

Fontaine gives the following table, showing the total amount of light which will be nightly employed:

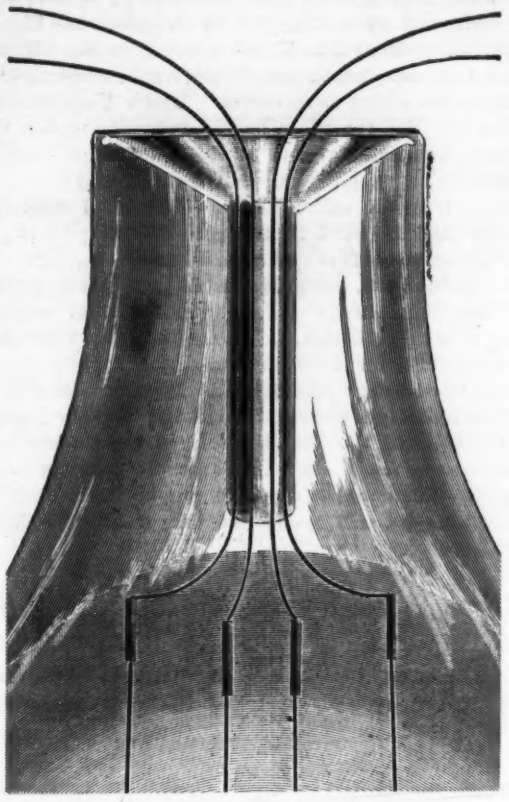
Lamps employed.	Units of 1,000 candles.
51 arcs of 60 ampères	510.0
100 " " 25 "	350.0
10 " " 15 "	20.0
726 " " 8 "	726.0
97 Jablochkoff candles	38.8
16 sun lamps	16.0
72 glow lamps of 500 candles	36.0
10 " " " 250 "	2.5
3,500 " " " 10 "	35.0
6,590 " " " 5 "	32.5
Total	1,766.8

In this table we have for simplicity assumed that one

carcel is represented by ten standard candles. Correctly speaking, it is 9.6 candles, and the total amount of light will thus be reduced to about 1,700,000 candles. There will thus be employed in the lighting of the Exhibition a candle power close upon 1¾ millions.

The Repair of Incandescent Lamps.

The illustration on this page shows the base of the lamp made by the Phœnix Incandescent Lamp Company, of Chicago. As will be seen, the terminal wires are left



BASE OF PHŒNIX LAMP.

free. This enables the lamp to be fixed in any socket, and therefore to be used in connection with any plant. These lamps are made of any size or candle power.

It may be mentioned that the company buy from intending customers the old sockets of used-up lamps and fix them on the new lamps sent out, thus insuring a perfect fit and effecting economy in the cost of maintaining an incandescent plant.

The Beacon Society and the Development of Practical Electricity.

A very interesting meeting of the Beacon Society was held in Boston on April 27, when the subject of "Electrical Development" was discussed. Among the speakers was Mr. C. A. Coffin, vice-president of the Thomson-Houston Electric Company, who, in the course of a very eloquent and pithy address, said: "Referring again to electrical enterprises, I would say that my own apparent enthusiasm is because it is largely a New England enterprise. I take no credit for myself or for my colleagues in furthering this great industry, but we give credit to the eminent scientific gentlemen who have made it possible for others to profit by their genius and skill. I would say, however, that our enterprise has been largely confined to local interests, though this has been but one part of our business. An important feature with us has been the organization of local companies. During the last seven years in the United States we have organized nearly 500 local companies, and it is interesting to note that notwithstanding indifferent knowledge, and with indifferent management of these companies, the basis of their business appears to be so secure, seems to give such guarantee of permanence, that less than one per cent. have got into any financial embarrassment, not one out of the 500 has failed to pay its obligations in full. The growth of these companies in the distribution of arc lights alone has shown an increase from about 1,500 lights, six years ago, to between 50,000 and 60,000 at the present time." Mr. Coffin added that there were in Massachusetts more electrical plants than in the whole of Europe, and that Italy stood at the head of European nations, with the largest number of electric light companies.

Mr. W. J. Jenks, of the Edison Company, followed with a neat speech, in which he mentioned that there were now 200 central stations and 1,525 isolated plants of the Edison system, representing a total dynamo capacity in this country of 1,126,000 lamps. He also said: "Very recently we have perfected a double transformer which safely performs two transformations, namely, turns current of high pressure into motion and in the same revolving armature turns the motion into a current of low and safe pressure; nay, more, Mr. Edison now has a device by which he effects these transformations without moving the armature at all."

Mr. C. L. Edgar, superintendent of the Edison stations in Boston, followed, with the statement that he was operating 17,000 lamps and furnishing 600 h. p. of current to 200 motors. Then came Mr. W. W. Gooch, counsel of the Boston Edison Company, and Mr. F. S. Hastings, of the parent Edison Company, who gave an outline of electrical advance and discovery, and mentioned a number of interesting incidents in the wonderful career of Mr. Edison. He closed with a handsome compliment to the skillful management of the Thomson-Houston Company and the practical merits of their system of arc lighting.

The "Edco" Storage Car.

The illustration on this page shows the experimental car "Edco," which has been built by the Electro-Dynamic Company, of Philadelphia, and equipped with the storage cells of the Electrical Accumulator Company. It has been running very successfully on the Darby branch of the Philadelphia Traction Company's line, on a trying section of the road. The engraving, for which we are indebted to the *Street Railway Journal*, shows the side of the car removed or transparent, bringing to sight the batteries, motors and gearing. The car is slightly heavier than ordinarily. Its two electric motors with the gearing weigh about a ton, and the 88 cells of battery in hard rubber cases weigh about 1¼ tons. The motors gear down from a speed of about 3,000 revolutions, and will each develop about 13 h. p. The cells are arranged to be thrown into series or parallel, and the car is placed under the driver's control by a switch wheel, shown at either end. It is stated that the car will easily run 60 miles on one charge.

The Paris Exposition.

(From our Special Correspondent.)

PARIS, FRANCE, April 23, 1889.—The grounds and buildings of the Exposition are now a scene of intense activity. Every body is doing his best to accomplish as much as possible in a short time, for every moment of the next two weeks is precious. All the exhibitors are busily engaged in making their spaces as attractive as possible. What were two weeks ago only areas of packing cases, dust and disorder, are now metamorphosed into leveled floors and systematic confusion. Each day sees some new feature bud forth and blossom, so that one is enabled to gain an idea of the immensity and grandeur of the Exposition as a whole.

Electric light men can be counted in scores, setting up their machinery and stringing wires. Most of the wires are buried, in the grounds and buildings, and they run in every direction, a perfect network. Laborers with pick and shovel are digging trenches everywhere, in which the wires, in or out of special conduits, are laid for lighting purposes or the transmission of power. The ironwork of the Eiffel tower has been completed two weeks, and arrangements are now being made for lighting it. Gas is to be the main illuminant, but two enormous arc projectors, made by Sautter & Lemonnier, of Paris, and of 100,000 candle-power each, will be mounted on the highest point of the tower, which will sweep the horizon and be seen at a distance of fifty miles.

Work is being rapidly pushed on the immense electric fountain which is now being erected between the Tower and the Grand Dome. It is to be the largest one of its kind ever erected, being after the style of the one lately at St. George's, Staten Island, only much larger. Several hundred arc and incandescent lamps, with vari-colored globes, will be burning under water, and the effects of the flashing lights on the jets of water will be beautiful and a sight well worth seeing.

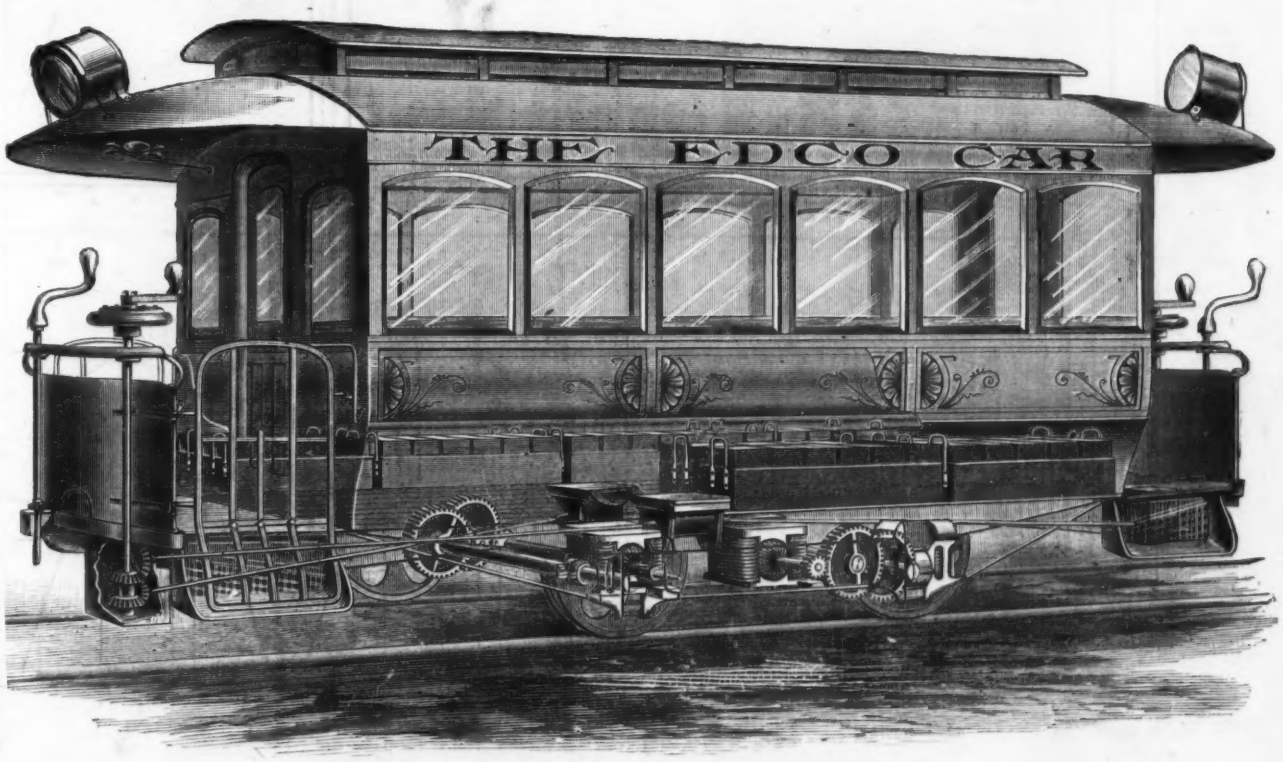
Machinery Palace is the only building in the Exposition which will be open to the public at night, and it will be made dazzling by several thousand arc lamps hung from the roof. The English and American spaces will have no less than 144 1,000 c. p. lamps as their portion, and these will be supplied by Crompton & Co., of Chelmsford, Eng., who will have a very handsome exhibition plant here in connection with that of Davey, Paxman & Co., Engineers, of Colchester, Eng. The Brown, Straight Line and Armington & Sims engine companies are all represented on the American space, and their engines are about ready for steam.

The Edison exhibit, which covers nearly one-third the United States space in Machinery Palace, or 10,000 square feet, and several hundred more in the Industrial Section, will be a grand affair. The first sight which greets the eye on entering the large hall is a mammoth incandescent lamp, made up of 25,000 perfect Edison lamps, the whole reaching a height of 40 feet—the largest thing of the sort ever attempted. This immense lamp, when it shoots forth its light from a filament composed of six thousand candle-power of red lamps, and the lights in the pedestal are flashed, will attract a great deal of attention. An office, handsomely furnished and lit by beautiful fixtures, will prove an attractive spot. A model 3-wire central station plant, having capacity for 1,200 lights, a municipal system in operation and an isolated plant, consisting of a 5-light and a 2,500-light dynamo, will be interesting features. A prize has been offered by the city of Paris for the best system of measuring electricity commercially, and the Edison people will have a complete meter room in connection with their central station plant. The ore milling and separating apparatus, an electrical art gallery, containing some gems on which artists have been engaged for months, and Mr. Edison's telegraphic, telephonic, pyro-magnetic and other apparatus, will each have its appropriate corner. This exhibit will be inclosed by a fencing of municipal lamp-posts and house lamps artistically arranged. The phonograph will have a handsome pavillion of its own in the Industrial Palace, where visitors from all parts of the world can each hear the phonograph sing, whistle, talk or swear in his own language.

The International Thomson-Houston Company, of America, has the space adjoining that of Edison, and Mr. E. Thurnauer, foreign representative of the company, will have many interesting things for the public to admire and wonder at.

A 100 h. p. generator will supply current to the Department of Agriculture, a mile and a half away, besides running a short electric road in the grounds. Professor Thomson's electric welding will be given a prominent place in the exhibit, and the company's alternating converter and combined house and street lighting systems will all be shown. Professor Abdank, whose recent visit to America will be remembered with pleasure by many friends, has in his care many of Professor Thomson's inventions and experimental apparatus, and exhibits of the long distance telephone, the Western Electric and Heissler companies, Okonite and various other wire and cable makers, each of whom have large and interesting displays.

The French Edison Company will be one of the largest generators of current in the Exposition. In their temporary station in the Champ de Mars will be 750 h. p. of engines driving two 800 ampère and six 450 ampère machines. Fifty horse-power in motors will be supplied to various exhibitors. Four thousand 4 c. p. lamps are to be placed in the gardens and grounds, and 2,535 10 c. p. and 300 16 c. p. incandescents, and 125 8-ampère and 25 24-



THE "EDCO" STORAGE CAR IN PHILADELPHIA.

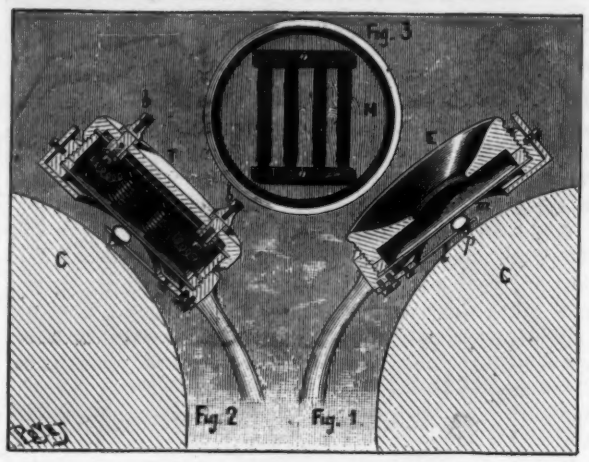
ampère arc lamps will be used to light up the porches and entrances. The remainder of the lighting will be done chiefly by the Société Gramme, Société Eclairage Electrique and the Compagnie Electrique, each of whom will have enormous plants. The Société Industrielle et Commercial; Fabius Henrion, of Nancy; Cuénod, Sautter & Cie., of Geneva, and others, all have large dynamo plants in the Exposition.

The exposition will be formally opened by the president of the republic at two o'clock on the afternoon of May 6, Monday, sure. Two phonographs will be placed on the desk in front of him, to record the words of the formal opening. One cylinder will be kept here in the exposition, and the other will be sent to Mr. Edison who will forward it to President Harrison. The president of the United States will thus be enabled to hear the president of the French Republic open the International Exposition of 1889. As the official cortège arrives at the Champ de Mars by the Pont de Jéna it will be greeted by salvos of artillery, and also when it passes under the Eiffel Tower, and reaches the Grand Central Dome, where the opening exercises take place. The president and distinguished guests will then visit the principal buildings and galleries of the exposition. All public monuments and buildings, the principal places, the bridges and quays along the Seine from the Island of St. Louis to the bridge at Passy, the Avenue Rapp, and the entrances of the exposition will be very handsomely decorated and draped. In the evening the buildings, monuments and gardens will be illuminated. A Venetian fête on the Seine, from Pont-Louis-Philippe to the foot bridge at Passy, will be held in the evening, when all the river steamboats will have bands of music aboard. A gold medal has been offered to the steamer which has the most artistic decoration, so that the river is bound to look lovely with the thousands of vari-colored lights afloat. Exhibitions of fireworks will be given at ten o'clock near the Pont-Neuf, in the gardens of the Tuileries and on the Isle of Grenelle. The gardens of the Champ-de-Mars and Palais du Trocadéro, the Eiffel Tower and the Grand Central Dome will be resplendently lit by electric lights, gas, fire balloons and Bengal lights. The great electric fountain will be lit for the first time (to visitors' eyes), the effects from which will be beautiful. A torchlight procession of several thousand cavalry, infantry, firemen and choral societies will march from the Trocadéro at half-past nine, pass through the Exposition grounds and around the town. The Eiffel Tower will be outlined against the sky in thousands of red, white and blue Bengal lights. The usual admission price of three francs (60 cents) will be charged the public, who will have full entrée to all the exercises in the Exposition for the whole day.

[E. W. H.

The Mercadier Telephonograph.

The perfection to which the phonograph has recently been brought naturally suggests the next step in the process, namely, the transmission of the recorded sounds to long distances telephonically. Our readers will remember the interesting experiment made on this subject by Mr. W. J. Hammer, on the Edison phonograph between New York and Philadelphia. The subject, it seems, has also been taken up abroad. In calling attention to the method by which this may be accomplished, M. E. Mercadier describes some interesting apparatus in *La Nature*.



THE MERCADIER TELEPHONOGRAPH.

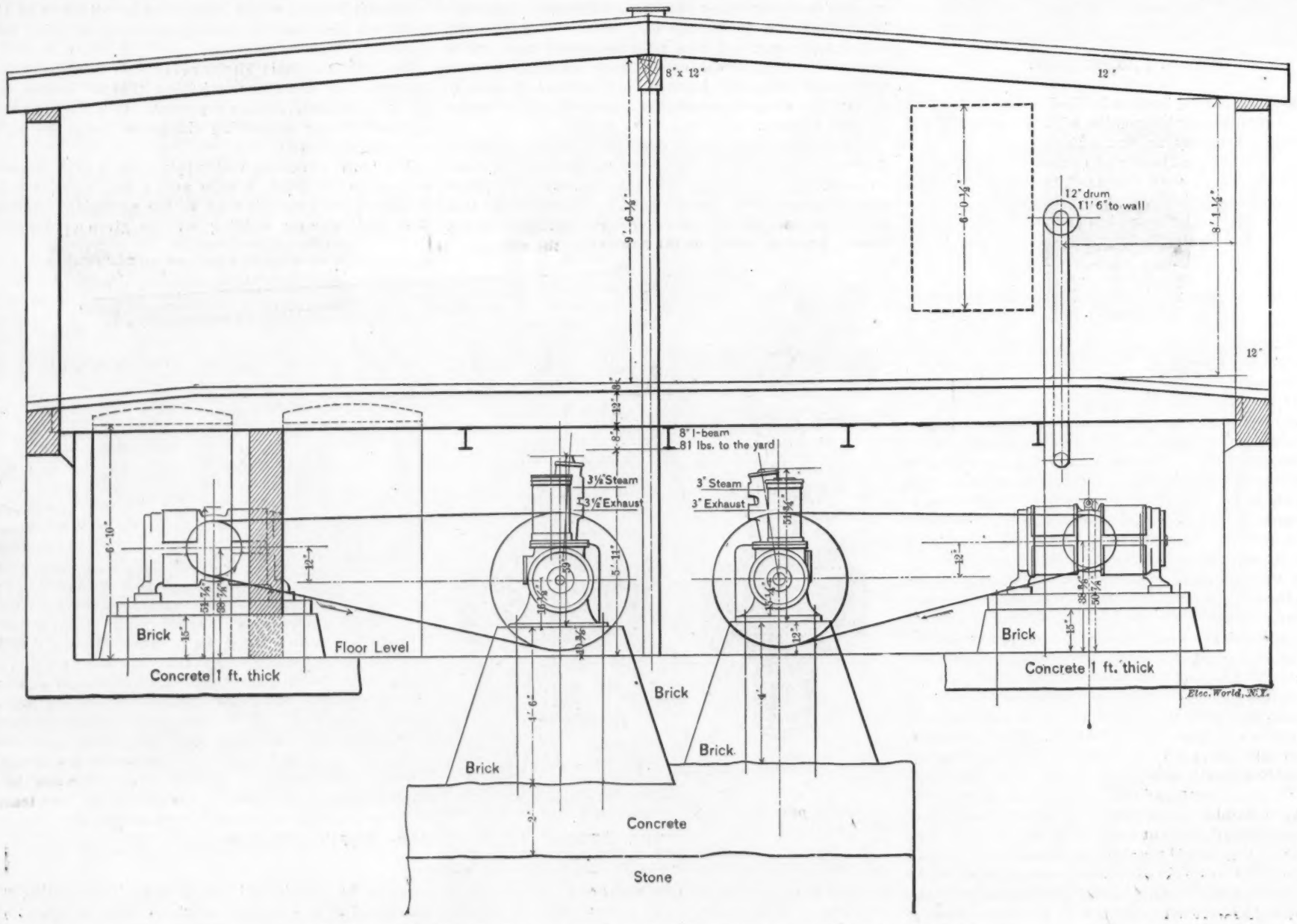
After having been present at some of the exhibitions of the graphophone by Mr. C. S. Tainter, and while waiting to obtain an instrument for his own use, M. Mercadier took up an old model of the Edison phonograph, in which tinfoil is employed as the recording medium. The mounting of the diaphragm of the old phonograph was modified, so that for the old style of transmitter there could be substituted either a telephone or a microphone. For the telephone the mounting was hollowed out on the interior and that of the transmitter on the outside, as shown in the accompanying engraving; and the mounting was so arranged that either one of these could be removed or inserted by screwing. The receiving telephone Fig. 2, was so arranged that the poles of the magnet of the telephone were at a very small distance from the iron of the diaphragm, which thus acted as a telephonic diaphragm. The microphone, Fig. 3, consisted of a disc of wood, on the back of which was mounted in the usual manner three or four cylinders of carbon, and these were arranged in such a way that the carbons were also a small distance from the diaphragm. It was found well to line the rim of the microphone with felt or rubber so that the vibrations of the ring could not be communicated to the carbon, and thus the air alone acts upon them. The microphone, of course, was in circuit with the usual induction coil and battery.

To make the experiment, the acoustic funnel *E*, Fig. 1, is screwed into the support provided for that purpose, and the diaphragm is talked to in a loud voice and very distinctly, as that unfortunately is necessary in order to obtain good results from the instrument. This is then unscrewed, and replaced, either by the telephone Fig. 2, or by the microphone Fig. 3, and placing in the circuit, as is usual in telephonic and microphonic transmission, two telephones acting as receivers. Under these circumstances when the record is passed under the stylus, the vibrations communicated to the diaphragm produce in the transmitting telephone the usual effect, and the same takes place with the microphone in the usual way. In both cases there is heard in the receiving telephones the sounds of the words first spoken into the phonograph.

This reproduction, notwithstanding the intermediate transformation of energy and the necessary loss accompanying it, is very distinct, at least so far as the reproduction is concerned, for it naturally is subject to the inherent defects of the original phonograph. The introduction of large resistances into the circuit does not notably change the distinctness of the sounds received, but it enhances the quality very much when the improved phonograph is employed. These experiments made in the month of October, last year, will be continued on a long telephone line.

Electric Light Plant at the Massachusetts General Hospital.

We illustrate on this page, in sectional view, the electric light plant recently installed in the Massachusetts General Hospital, under the supervision and from the designs of Mr. C. J. H. Woodbury, the consulting engineer of the hospital. The plant is of the United States system, and comprises 586 lamps of 16 c. p. and 2 lamps of 125 c. p. These lights are supplied with current by two United States dynamos, one of 375 lights capacity, nominal, and the other of 225, driven by two Westinghouse engines.



ELECTRIC LIGHT PLANT, MASSACHUSETTS GENERAL HOSPITAL, BOSTON.

The original foundations were bad, but a large mass of stonework covered by two feet of concrete was laid before beginning on the brick foundations of the engines, the result being that the whole plant is noiseless.

The dynamos are placed in a room formed by partitioning off a portion of the coal shed, and although within

two feet of high water mark, this is rendered dry by a coat of cement on both the inside and the outside of the foundation of the building, as well as a brick pavement laid in cement. The exhaust steam from the engines passes through a grease extractor and thence to the steam heating system of the building at a pressure of six pounds. When the steam is not needed for this purpose it can escape through an exhaust nozzle at the top of the chimney, with no appreciable back pressure, the whole operation being noiseless and very economical in regard to the actual amount of fuel necessary for its maintenance.

The lamps, protected by nettings and with flexible connections, can be put in the beds when necessary. The positions and arrangement of the lights were selected by Dr. John M. Pratt, resident physicican of the hospital.

The Lockwood Ammeter and Polarity Indicator.

This instrument has been designed to specially meet the requirements of central station constant current work. The accompanying engravings show the general appearance of the instrument, and with the following explanation its operation can be readily understood.

The instrument is connected into circuit by means of the lugs on the face of the cut-out, as shown above the case, the cut-out being so designed that by simply screwing in the plug and throwing out the links the ammeter can be removed without opening the circuit. In operation, the pointer of the instrument hangs perpendicular when no current is on, standing directly over the zero mark on the scale; as current is passed through the instrument, the pointer indicates on the scale the number of ampères passing and also the direction, or polarity of the current, the latter being indicated by the direction in which the pointer is deflected. A deflection to the right, or "white," side of scale, indicates a right direction of the current, and a deflection to the left, or "red," side of scale, indicates a wrong direction of the current.

THE LOCKWOOD AMMETER AND POLARITY INDICATOR.

In using the instruments on constant current circuits a fixed index is attached to the scale, one on each side, at the point of normal current, thus enabling the operator to see, even from a distance of twenty or thirty feet, a very slight deviation from the normal current. The pointer also shows the slightest unsteadiness of the current, so that a single glance at the instrument shows the direction of the current, its strength and whether steady or not. On the face of the case of the instrument, the name plate has an opening in which to put the number or name of the circuit.

In a station fitted out with one of the instruments on each circuit, the whole number arranged in a row over the switch board, and the number or name of each circuit on the front of each case, a dynamo tender can watch the operation of everything from one point, and tell with certainty in making changes whether the circuits are affected or not, and if so, in just what manner, thus enabling him to locate the trouble and remedy the same in the shortest possible time. He can also tell, when running a number of circuits in series, whether any are wholly or partially cut out by grounds, etc.

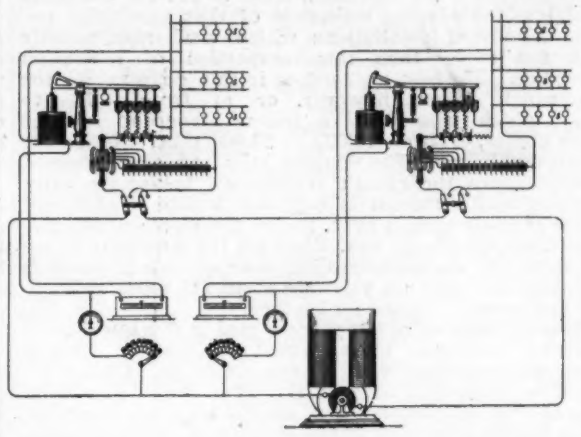
Another great advantage from a business stand-point is that where the instruments are used, it is not necessary to keep any so-called "signal lights" in the station, as the instruments are far better indicators of the condition of the current than any light; these lights can thus be rented out and the revenue from the same, in a very few weeks, pay the cost of the instruments.

The instruments are exceedingly simple, and are so constructed that by following the directions as given on the inside of the case, any one can keep them in proper condition.

These instruments are now in use by the Peninsular Electric Light and Power Company, of Houghton, Mich.; Toledo Electric Company, of Toledo, O.; Thomson-Houston Electric Light Company, of Detroit, Mich.; Strawbridge & Clothier, of Philadelphia, Pa., and several other large concerns. The Central Electric Company, of Chicago, have obtained the western agency for these instruments, which are manufactured by the Lockwood Instrument Company, of Detroit, Mich.

The Curtis Pump Pressure Regulator.

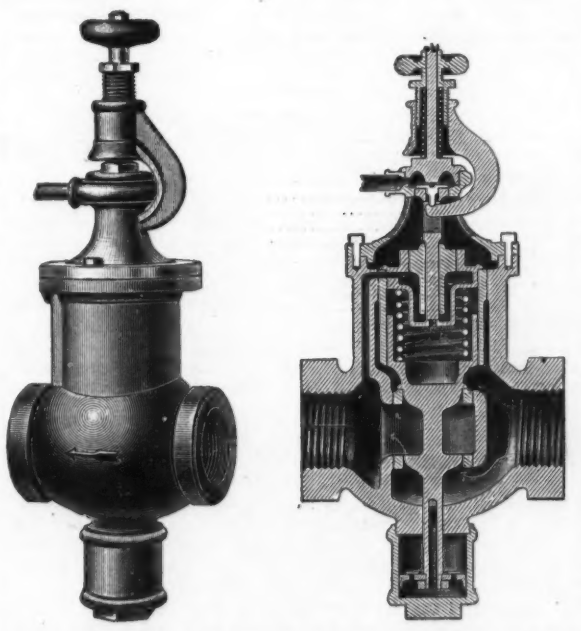
We illustrate in the accompanying engravings an improved pump pressure regulator recently designed by the Curtis Regulator Company, of Boston. The improved regulator is an adaptation of the ordinary Curtis pr essure regulator to the peculiar requirements of pump pressure regulation, which is accomplished by removing the phosphor bronze diaphragm from contact with the steam, and placing it in the top of the regulator, extending the secondary valve



PRESCOTT'S SYSTEM OF STORAGE BATTERY DISTRIBUTION.

up to meet it, and connecting the chamber over the diaphragm to the pipe or tank in which the water pressure is to be controlled; so that any change of pressure in the pipe or tank operates on the diaphragm, and closes or opens the valve placed in the steam pipe of the pump.

In order that the valve shall have a gradual, smooth opening, a dash-pot is placed at the bottom of the regulator, the piston of which forms a part of the main valve, and effectually prevents any sudden opening of the valve, which might have an injurious effect on the pump, without in any way interfering with the sensitiveness of the regulator. The valve is placed in the steam-pipe, near the pump, and the union at the top is connected to the pipe or tank in which it is desired to maintain a uniform water pressure. Steam is let on to the pump, and the water pressure is regulated by turning down (or in) on the top handle of the regulator, until the desired water-pressure is obtained. When once set at a given pressure, the pump will maintain that pressure until the position of the handle is changed, no matter what the quantity of water used. Turning down on the handle sets the regulator at



FIGS. 1 AND 2.—THE CURTIS PUMP PRESSURE REGULATOR.

a higher pressure, and turning back sets it at lower pressure.

We may add that these regulators are in general use on hydraulic elevators, air compressors, hydraulic presses, and in a large number of other situations.

Prescott's System of Storage Battery Distribution.

In the usual system of distribution by means of storage batteries the sub-stations in which the batteries are situated are connected with the charging station by two or more main leads called the charging circuits.

In this arrangement of apparatus, when the dynamo is being operated to charge the battery at any given station and the working-circuit is simultaneously supplied from the battery, it happens that the excessive electromotive force necessarily employed to charge the battery is manifest and is injuriously active in the working-circuit, as the increased potential drives the lamps at a higher illuminating power than that for which they are intended, and hence shortens their life.

In order to avoid this difficulty and control the potential of the sub-station from the main station, Mr. Geo. B. Prescott, Jr., has devised a novel system, which is illustrated in the accompanying diagram. As will be seen, the working circuit at the sub-station is connected with the central station by a circuit composed of two conductors. Located in circuit with these conductors at the central station is an indicating instrument. In a separate circuit at the sub-station there is placed an electro-magnet controlling a switch for introducing or withdrawing, successively, a series of electrolytic cells yielding an electromotive force the reverse of that due to the main battery. In the short circuit normally existing round these cells there is a low artificial resistance of considerable capacity, useful in preventing the rapid discharge of these cells. In addition to this there is provided a switch at the central station for completing a third circuit between the central station and a sub station and for varying the current flowing therein. This third circuit is practically electrically independent of the charging-circuit and of the indicator-circuit, but is composed of parts of both and includes the electro-magnet controlling the switch at the sub-station. When the indicator at the central station shows a variation from the normal electromotive force in the working-circuit at the sub-station, the resistance in the third circuit is varied, thus operating the switch at the sub-station to change the number of electrolytic cells in opposition to the electromotive force of the battery at the sub-station, and thus the electromotive at the lamp terminals is varied, so as to be maintained constant whether the battery is being charged or not.

Pyke & Barnett's Flame Spark Coil with Continuous Action Rapid Break.

A short description of this apparatus was given in the London *Electrical Review* some time ago, and we now have pleasure in illustrating the commercial model of the

PYKE & BARNETT'S FLAME SPARK COIL.

invention, at present made and stocked by Messrs. Woodhouse & Rawson, of London. The design has been rendered more compact, and the moving parts of the break (which is in the recessed centre of the coil) project above the top-board for ready adjustment. The break is said to be quite a new departure, and from its certainty of action forms, perhaps, the most valuable improvement in these coils. The principle of its action is as follows: A hammer, mounted on a short thick spring, is very rapidly and vigorously vibrated by means of an electro-magnet included in a shunt circuit, and the main or coil contacts are so arranged that (one of them being mounted on a spring) on the recoil of the vibrating hammer it strikes against the movable main contact, and causes a slight and instant separation. The whole of the parts are arranged for ready and rapid adjustment, and the flat contacts are arranged on screws which are readily removable for re-platinizing. The arrangement of the dischargers is also very neat, and not so liable to damage as the old style. The size of the coil (No. 1) is 5 inches diameter by 4½ inches high. Other sizes of this convenient high tension current generator will be shortly procurable.

Electric Railway at Atlantic City, N. J.—During the last week the Sprague Electric Railway at Atlantic City was started, and the operation of the road on the trial trip of the cars was perfectly successful. The cars ran over the entire distance of the road at a speed exceeding 15 miles an hour, towing another car behind them. A number of the officials of the road were present, and expressed great satisfaction at the operation of the cars, their ease at starting, and in rounding the curves. The equipment of this road includes the new 15 h. p. motors of the Sprague Company, and all the latest devices and improvement in use upon Sprague street railways. The system of roads at Atlantic City, which is now being completely equipped with electricity, is controlled by the Pennsylvania Railroad Company. Before adopting any system upon this road the officials of the railway company made a thorough investigation of all the systems of electric propulsion, both cable and electric, in use in all the cities of this country, and during the investigation, which lasted about five months, visited nearly all the cities in which there were electric railways in use. They were so thoroughly satisfied by this investigation that electricity is the most convenient and economical as well as reliable force for operating the street cars, that they gave orders to cover the entire equipment at Atlantic City. The road will carry very large numbers of passengers during the coming season.

Annual Meeting of the American Institute of Electrical Engineers.

The annual meeting of the American Institute of Electrical Engineers for the election of officers for its sixth year, and the transaction of other business, will be held at the house of the American Society of Civil Engineers at 127 East 23d street, New York, on Tuesday evening, May 21, at 8 o'clock.

The morning session of the general meeting for the reading and discussion of professional papers will be held at the same place beginning at 10 A. M., May 22. A collation will be served at 1 P. M., after which the meeting will re-assemble for the afternoon session at the College of the City of New York, No. 17 Lexington avenue, adjoining; where suitable electrical apparatus will be provided for experiments connected with such papers as require them. The following papers will be read by the authors: "Modern Views as the Nature of the Electric Current," with experiments, by Prof. H. A. Rowland, of Johns Hopkins University; "The Inherent Defects of Lead Storage Batteries," by Dr. Louis Duncan, of Johns Hopkins University; "Motor Regulation," by F. B. Crocker; "The Measurement of Telephonic Currents," by Prof. Chas. R. Cross, of the Massachusetts Institute of Technology; "The Relation Between the Initial and Average Efficiency of Incandescent Lamps," by W. H. Peirce of the C., B. & Q. R. R.; "Some Results with Storage Batteries in Train Lighting," by Alexander S. Brown, of the P. R. R.; "Magnetism and its Relation to Induced Electromotive Force and Current," by Prof. Elihu Thomson; "The Efficiency of the Arc Lamp," by H. Nakano, with an introductory note, by Prof. E. L. Nichols, of Cornell University; "The Personal Error in Photometry," by Prof. E. L. Nichols, and "The Spiral Coil Voltameter," by H. J. Ryan, of Cornell University.

Wiring the Colonnade Hotel, Philadelphia.

We have had occasion recently to publish a number of highly interesting articles on the subject of interior wiring. The matter is an important one and involves many questions and problems. An illustration of the manner in which such work may be done is afforded in a report just made by Mr. C. O. Mailloux, the electrical expert, on the wiring of the Colonnade Hotel, at Philadelphia, by Messrs. W. S. Griffith & Co., of that city. It may be added to the subjoined report that the Grimshaw white core wire of the New York Insulated Wire Company was used on this installation.

The generating machinery is located in quarters in the rear of, and separate from, the hotel building proper. It comprises two 500 light "Mather" dynamos of the incandescent lighting type, each being belted direct to its own engine, so that the two machines can be operated independently of each other. The current from each machine is brought by a pair of large and heavily insulated "mains" to a switch-board located in convenient sight of the dynamos. The appointments of this switch-board are very complete without being at all complicated. The switch-board is accessible from both sides, and the dynamo and circuit connections are made from behind. There is room for ten distributing circuits, five on each half of the switch-board, each circuit being provided with an independent switch. There are, in addition, three main line switches, by manipulating which, either group of five circuits at each half of the switch-board can be connected to either dynamo, or both groups connected together to either or both dynamos. The switch-board also carries the ampère and voltmeters and the regulating resistances for both dynamos.

The distribution of the electric current to the lamps throughout the hotel is provided for according to the most approved plan, so as to insure the greatest possible uniformity of light at all points. This plan consists in making the starting point of distribution of the conductors as nearly as possible central with reference to the building and the lamps. The lamps are divided into eight distinct groups, the lamps on each floor being in one group.

Each group has its separate main line conductors leading to the switch-board and corresponding to one of the ten switches. The eight pairs of conductors pass down from the switch-board to an underground passage, and find their way to a point nearly central in the hotel basement. Each circuit is provided at this point with safety cut-outs, and then branches off to either side of the building, to a point corresponding to the hotel corridors above. The conductors then run upward under moldings along the walls, each pair leading to another safety cut-out when it reaches the story or floor intended. From this point the conductors again branch off in different directions to other cut-outs, whose branches in turn lead to the lamp fixtures in the different apartments. It is thus seen that the points of subdivision of the branches themselves are made central with respect to the lamps which they supply. The size of conductors throughout is calculated and proportioned so that there will be as nearly as possible the same reduction of electrical pressure or "voltage" in all the groups, and along their branches, when feeding their maximum number of lights. In this way the uniformity of light in all the lamps, no matter how far distant from the dynamo, is insured.

The results of the tests, which are detailed further, show that this installation greatly exceeds the highest standards of excellence, in regard to safety from leakage of current. The extremely high insulation which the entire net work of conductors is shown by these tests to possess, could only have been obtained by using nothing but high grade insulation throughout for the conductors, and by taking the most minute precautions in the work of installation. Examination of the net work of conductors shows that such was the case here. The high grade insulation was used for all the conducting wires, without excepting even those in certain situations, where a lower grade is ordinarily deemed sufficiently good. On these conductors there is an inner covering of pure rubber of very high insulating power, and an outer and thicker protective, as well as insulating, coating of vulcanized rubber, with a layer of textile wrapping intended to afford protection against mechanical injury to both insulating coverings of the conductors. Experience shows that some leakage is apt to occur at joints; and for this reasons the number of joints was made as small as possible, and the greatest care was bestowed upon such joints as were actually made, to insulate as perfectly as possible.

Authorities differ considerably as to the proportion of leakage which is allowable in a given installation; that is to say, as to what should be the minimum insulation in a given case. For installations using pressures of 200 volts or less, the ratio of loss is placed by some at $\frac{1}{200}$ of the maximum current carried in the mains. This means that the resistance of the insulation must be at least 500 times as high as the working resistance of that particular circuit. I know of installations which work satisfactorily with not more than this proportion of insulation resistance. The best authorities in this country set the loss much lower, however, or at from $\frac{1}{10000}$ to $\frac{1}{25000}$, which would make the resistance to leakage much higher, or from 10,000 to 25,000 that through the circuit and lamps. The highest standard ever proposed is 50,000 times the circuit resistance. Taking the latter standard in this case, it is easy to calculate what should be the insulation resistance, under the *most unfavorable conditions*, that is to say, when all the lamps are in use and when the electromotive force or electric pressure is at its highest point (in this case about 125 volts), so as to give the greatest chance for leakage.

The total number of lamps connected in this installation is about 1,000, each taking about $\frac{55}{100}$ ampère; whence the circuit resistance with all the lamps on, at 125 volts, would be $\frac{125}{550} = 0.23$ ohm nearly. The total insulation resistance at the switch-board should then be, according to the *highest standard*, 50,000 times 0.23, or 11,500 *ohms*. It will be seen further that this figure is greatly exceeded.

The apparatus first tried for making the measurements was a Wheatstone bridge capable of measuring, in round numbers, 100 times the above mentioned resistance. It was found, however, that the insulation resistance was considerably higher than this, and another method of measurement was employed. This other method is the well-known "substitution" method. The electromotive force used was 106 volts, produced by standard cells, and the measuring instrument was a delicate galvanometer carefully adjusted and calibrated for the purpose. By means of this apparatus, measurements could be made up to over 1,000 times the above calculated resistance.

The tests were all made at the switch-board, so as to include the leakage of every portion of the network of conductors. In addition to the combined test of all of the eight circuits, together with the dynamo, each circuit was also tested separately from the switch-board, and the insulation of the switch-board with the leakage in the switches was also determined. The insulation of each circuit by itself, without the switch-board leakage, was obtained by calculation. In making these tests particular pains were taken to secure a perfect ground so as to *favor* leakage as much as possible, and a ground connection was made with both the gas and water pipes in the building. Moreover, considering that as a rule such measurements are made with electromotive forces ranging from 10 to 50 volts only, the employment of an electromotive force as high as 106 volts, as in this case, would further *favor* the leakage. In order to make still further concession, only the lowest results were considered in the following table. It is seen that under these severe conditions the insulation exceeds greatly the amount that would be deemed sufficient by all authorities:

TABLE OF MEASUREMENTS.

	Actual insulation at switch-board. Ohms.	Calculated Insulation of circuit alone. Ohms.
Switch-board alone	12,255,000	.....
Circuit No. 1	3,064,000	4,070,000
" " 2	3,064,000	4,070,000
" " 3	6,808,000	15,330,000
" " 4	3,104,000	4,230,000
" " 5	3,230,000	4,360,000
" " 6	3,064,000	4,070,000
" " 7	3,064,000	4,070,000
" " 8	10,212,000	61,310,000
Circuits in groups.		
Nos. 3 and 8	3,064,000	4,070,000
" 6, 7 and 8	4,083,000	6,120,000
All circuits together	2,785,000	3,600,000
All circuits and dynamos	2,664,000	.....

It is seen that the insulation is found lowest, as should be the case, with the circuits and dynamos all connected to the switch-board. The insulation is even then far in excess of what is required. In fact, as compared with the insulation calculated by the *highest* standard, the insulation is 231 times better; and as the highest is itself 100 times higher than the lowest given standard, it follows that the insulation of this plant is more than 20,000 times higher than what some authorities deem sufficient.

When gauged by the standards of the best authorities in this country, the insulation would still be found from 500 to 1,000 times more than sufficient. This margin ought certainly to dispose effectually of any question which may arise about safety from shocks or fire. I may further add that there is not to my knowledge any installation of the same capacity with such perfect insulation either in New York or Philadelphia.

Centennial Electrical Notes.

The great Washington centennial has come and gone, and on the whole has been greatly enjoyed by New Yorkers. The ceremonies, parades, festivities and decorations were such as will never be forgotten by those who saw them or participated in them, and it is a matter for general congratulation that the great occasion passed off so brilliantly and successfully. It might perhaps have been a little more brilliant, had not Mayor Grant been so ruthless in cutting down the electric light poles and wires uptown, but this ill-timed act was atoned for by the efforts of various citizens and public bodies who illuminated their buildings in the localities where the lamps had been extinguished.

In one way or another those connected with electrical pursuits and industries in the city found plenty of occupation during the three days, either in preparing effects, or in admiring them and in witnessing the immense pageants that swept through the main thoroughfares each day. It is interesting to note by way of preliminary that the movements of the military and civic parades on Tuesday and Wednesday were remarkably facilitated by means of the special telegraph wire leased by Col. S. V. R. Cruger from the Western Union Company and equipped with a special corps of efficient operators. The stations were established at several points along the route, and then the various notifications were exchanged from the ends of the line and from various intermediate points, more particularly the presidental reviewing stand, so that the movements of President Harrison and all the parading bodies were at all times closely regulated by the telegraph, to their immense convenience. Thus on Tuesday, when President Harrison reached the grand stand at 1:05 o'clock P. M., Colonel Read telegraphed to Colonel Cruger that the presidential party were in their places. The troops were at once directed to move, and at 1.06¼ the head of the parade passed the reviewing stand. In the same way at the close of the day, the passing of the last body of troops was notified and one minute later the president was entering his carriage and "good night" was telegraphed to each operator along the line. The same methods were observed during the magnificent industrial parade on Wednesday, with equally good results.

There was naturally a great deal of special electric lighting in connection with the festivities, and a conspicuous performance in this line was that of illuminating the President's table on Monday in the banqueting room at the Equitable Building, 120 Broadway. This table was a most beautiful sight, and was one that was seen by comparatively few people, among whom, however, happened to be a representative of THE ELECTRICAL WORLD. The work was done by Mr. W. Wheeler, the electrician in charge of the well-known "gilt-edged" United States plant in the basement of the Equitable Building. Mr. Wheeler and an assistant spent two days wiring the banqueting table for 114 16 c. p. lights. The work was necessarily difficult on account of the multiplicity of other decorations and the arrangement of the pieces de resistance.

The banqueting-room of the Equitable Society, in which the table was placed, is about 100 feet long and 50 wide, massively paneled and finished in old oak. A very fine electrolier by Mitchell, Vance & Company hangs in the centre. The table was 38 feet long and 30 feet wide, and was covered with white table cloth exposed to a width of 18 inches. At this table sat 44 guests, President Harrison being at the head. All around the table inside the linen was a bower of exquisite roses, in the banks of which Mr. Wheeler had inserted 44 lamps, one before each guest.

These lamps were covered with shades of pale pink silk, so that when the current was thrown into them they also looked like flowers, save that their perfume, so to speak, took the form of a soft mellow glow. At the centre of the table was one immense mound of Magna Charta roses; and up from this mass sprang a large palm tree, spreading its graceful boughs over the table in every direction. Skillfully distributed among the leaves were 23 lamps, also covered with pale pink silk. The rest of the table was covered with crescents, wreaths and other flowery trophies, and all of them were touched up with lamps effectively distributed. The effect was, in a word, that of fairy land, and so surpassingly beautiful, that, it is said, exclamations of delight broke from the guests. Mr. Wheeler divided the lamps into four circuits, and had them all under perfect control, so that very ingenious and pretty effects could be obtained.

The beautiful triumphal arch at Waverly Place and Fifth avenue, designed by Stanford White, was brilliantly illuminated with 350 Edison lamps of 16 c. p. These lamps were distributed all around the inner and outer edges of the arch, defining its outline in a marvelously distinct and beautiful manner, and throwing all the flags and decorations into high relief. This illumination has practically been the talk of the town for the week, and has been nightly seen by thousands and thousands of people. It is said that a large part, if not the whole of the expense, was borne by the Misses Rheinlander, living at the corner of Waverly place and Fifth avenue, in the rear of whose property a temporary Edison plant was put up, supplying current to the lights on the arch. This plant was run by Mr. E. Mulcay, engineer and machinist, at 65 Fifth avenue, who also had a hand in the installation on the new "Yorktown," illustrated in these columns some time ago.

The Union League Club-house on Fifth avenue near Forty-second street was admittedly the most successful piece of such illumination in the city, with the possible exception of the Waverly Place arch. The House committee, Messrs. Cooper, Slade and Wood, had the matter specially in hand, and secured the assistance of Mr. J. H. Vail, the well known general superintendent of the parent Edison Electric Light Company. At the corner of the building were two rows of 100 c. p. lamps, making 24 lamps in all. On the Fifth avenue side of the building were four rows of 16 c. p. lamps, set 12 inches apart, colored red, white and blue, running from the top of the building down, and there were two colored rows on the Thirty-ninth street side. These lights were all flashed alternately and collectively, and the unfamiliar and beautiful sight attracted immense crowds of enthusiastic spectators, the huge building, with all its beautiful bunting and trophies, being as bright as day. The installation was carried out on the Edison system by Buehler & Bateman, and the current was furnished by President J. I. Beggs from his up-town Edison station in Thirty-ninth street. The total illumination was in the neighborhood of 8,000 c. p.

The heaviest undertaking in the line of special lighting was that connected with the Centennial ball, on Monday, April 29, at the Metropolitan Opera House. This work was assumed by the local Edison company, who supplied the current from their up-town station in Thirty-ninth street, near by. No fewer than 1,100 frosted lamps of 16 c. p. were used for the occasion. Suspended from the ceiling of the ball room were 25 floral fixtures, with 12 lamps of 16 c. p. intertwined with natural ferns, palmettos, flowers, vines, etc., set in tasteful wickerwork baskets. Arranged around the walls of the banqueting room were 52 brackets fitted up with corrugated opal shades over the bulbs, and each having a coronet of polished brass stars. Around the President's platform were loops of lamps festooned on poles set at the side and over the stand, and these loops were draped with flowers, leaves, etc. Over the main entrance were 8 lamps of 100 c. p. each, and in various parts of the hall were special effects in shields, arches, trophies, etc. All this was designed, constructed and carried out by Mr. J. Van Vleck, the electrician of the company, whose wire-

men also did all the special wiring with the utmost neatness and expedition.

The Edison United Manufacturing Company, at 65 Fifth avenue, had a very effective illumination, which consisted of a group of 16 lamps mounted at the capital of each pillar. There were also seven stars, draped with red, white and blue bunting and 13 lamps on each star; a line of 42 lamps along the edge of the sign between the two floors, and the word "Edison" in 129 small colored lamps over the door. Among those present at the United offices on Wednesday were Mr. and Mrs. Edison.

The Eden Musée, on Twenty-third street, had outside a large globe covered with 150 Edison lights run from its Edison plant of 300 lights, driven by an Armington & Sims engine. These lights showed off to great effect the elegant decorations and bunting on the front of the building.

The palatial dry goods house of Stern Bros., on Twenty-third street, between Fifth and Sixth avenues, was brilliantly illuminated, and the illuminations were continued through the week. On the front of the building was a huge heart-shaped shield in red, white and blue, built up of ninety 16 c. p. lamps, and the cornices of the four floors were picked out with 130 lamps of 32 c. p. The lights were run from two Edison No. 20 machines of a capacity of 750 lights each, which are in ordinary use for lighting the 1,400 lamps in the store, and are driven by a 225 h. p. Watts & Campbell Corliss engine. Mr. Hugh Miller, the engineer in charge of the plant, wired the front for the centennial illumination, the interior being done by Buehler & Bateman. The shield referred to was a work of art, and was greatly admired by the throngs passing up and down Twenty-third street.

The Empire City Electric Company, 17 Dey street, had a very unique exhibit in their window of an old candle of 1789 alongside of a 75 candle incandescent lamp of 1889. Their window was also elaborately decorated with bunting and various tasteful and effective designs.

Over in Brooklyn, Wechsler & Abrahams had their big dry goods palace splendidly decorated from top to bottom of the front. The building was covered with bunting and special decorations, and among the various pieces and flags were distributed some 50 or 60 arc lamps, so that during the night that part of Fulton street shone like the day. The lamps (Thomson-Houston) and the current were furnished by Mr. Peck, the manager of the Citizens' Electric Light Company.

Various of the electrical concerns along the line of route had decorated their establishments in a very effective and tasteful manner, and had made provision for their friends in the way of special stands from which to witness the parades. Among them may be mentioned the local Edison Company, on Fifth avenue and Thirty-ninth street; the Phonograph Company, at 257 Broadway; A. L. Bogart, Union Square; the Brush Company, in Union Square; the Edison United Manufacturing Company, at 65 Fifth avenue; the Okonite Company, on Park Row; Mr. A. H. Patterson, of the Phœnix Glass Company, at 729 Broadway, and the New York Insulated Wire Company, at 649 and 651 Broadway. THE ELECTRICAL WORLD wishes to acknowledge the receipt of many favors and courtesies during the parades at these last two places, where Messrs. Patterson, Gallaher, Godfrey and others, did their best to make their friends happy and comfortable. The beautiful new offices of THE ELECTRICAL WORLD, in the Times Building, were crowded on Monday and Tuesday by visitors anxious to see the celebrations to the best advantage, and who on Monday afternoon were greatly delighted with the view obtained of the reception of President Harrison at the steps of the City Hall by the white-robed girls from the public schools, who scattered roses up and down the steps as the President advanced into the building to hold a public reception.

The Western Electric Company threw open the roof of their fine new building at the corner of Greenwich and Thames streets on Monday, to all their friends to view the naval parade. The Western Union and Postal Telegraph Company's offices were also occupied by large gatherings; while from the Commercial Cable, Western Union, Edison and Sprague offices on Broad street, a fine view was obtained of the ceremonies on Tuesday, when Mr. Chauncey M. Depew made his oration and Whittier's poem was read.

Among the features of the great Industrial Parade on Wednesday were several floats on which industries were being actively carried on. On one of the floats Runkel Bros. illustrated their method of making chocolate confectionery. The machinery was run by a Sprague motor placed at the side of the car, and the current was supplied from a battery of Julien cells, placed in the body of the truck. A neat model of the Brooklyn Bridge in the exhibit of the German societies, was lighted by a set of 18 Julien cells, furnishing current to 16 4 c. p. lamps. A neat little printing office establishment was shown in operation on one of the trucks, driven by a C. & C. motor of the new type, and specially wound for 55 volts. The current was furnished to it by a set of Gibson storage batteries. Another very interesting exhibit in the electrical line was that of a Stephenson car equipped with Thomson-Houston motors intended to be used with Julien batteries on one of the street railways of Brooklyn. Another exhibit, which also attracted considerable attention, was that of The American Leather Link Belt Co., who illustrated their method of making belting, and who distributed among the crowd thousands of the links, which were eagerly seized upon as mementos.

Some New Sprague Electric Roads.

The coming of summer is heralded by the large number of street railways which have decided to adopt electricity upon their roads. During the Centennial week that has just past, a number of railway companies have signed contracts for complete electrical equipments, and it is interesting to note that among these is one of the largest and most important street railways in the city of St. Louis, Mo. We understand from the Sprague Company that they have closed a contract with the Lindell Avenue Street Railway Company, of St. Louis, Mo. This contract calls for ten cars of 30 h. p. each, to be operated over 5 miles of track. The overhead system will be used, and the line covers some of the most crowded and prominent streets of that city. The contract of this company with the Sprague Company calls for a complete equipment, including dynamos and full station plant.

Another of these contracts is with the Wilkesbarre & West Side Railroad, of Wilkesbarre, Pa. It will be remembered that the Wilkesbarre & Suburban Railway was one of the first to equip with electricity, and since this road has been put into operation its success has been so great that its management have ordered an additional number of cars. The installation of this second line in the same town is a most gratifying indication of the success which electric railways have gained. This line will extend over four miles of track, and the equipment will include three complete Sprague cars and all the latest attachments.

The Bay City Street Railway Company has also contracted for electrical apparatus during the past week, and this equipment calls for eight cars and five miles of track. Before deciding upon the Sprague system the Bay City, Mich., Railway Company made an investigation of electric railways now in use, and visited a large number of cities in which there are electric railways in operation.

Results with the Gibson Storage Battery.

Mr. Chas. L. Clarke, the treasurer of the Gibson Company, writes us as follows: In view of the fact that the Gibson Electric Battery is giving complete satisfaction in practical use the following latest advices from two of these batteries will be of interest. The battery in Gen. Brown's yacht has been in use for several months with no attention from this company since it was installed. The battery in New Orleans is operated on a street car with the most flattering results. The run of 57 miles mentioned was made on a single charge, and is double the distance obtained under same conditions with any other storage batteries.

Letter from Chief Engineer Gen. Brown's yacht "Ballymena," dated at St. Augustine, Fla., April 22, 1889: "It gives me pleasure to say that your battery is improving all the time; in proof of this I will say, that I have not charged it since the 8th of this month, and still have enough current on hand for several nights; of course we have not used all the lights, but have used from four to six lamps until 10 o'clock every night during that time. The battery is certainly the best one for yachts ever in use. We have had some very rough weather on our last cruise, and it never failed to work, even when it was impossible to get lights from the dynamo. Another good feature is, no matter how much we roll, we have never spilled any of the acid, which has been the trouble with several yachts we have met on our cruise. Mr. Brown has spoken very highly of your battery to several yacht owners. I examined the cells two weeks ago and put about one gill of water in each cell."

Letter from engineer in charge in New Orleans, dated April 21, 1889: "The car was run all day, making 57 miles, 120 stops, and to-day being Sunday, we had more or less passengers aboard. We carried almost all the stockholders of the horse car company, and they one and all want electricity."

Giving a Motor a Bath.

To the Editor of the Electrical World:

SIR: I noticed in your number of the 13th ult. an interesting article headed "An Amphibious Motor," written by Mr. Wightman, in which he describes the bath that a motor was treated to while running at the factory of the Thomson-Houston Company at Lynn. Mr. Wightman states that the idea is not a new one, but that he believes that this is the first time the experiment has been tried. He is mistaken in this, however, for some time ago an armature was given a much more severe test than this by the Sprague Electric Railway and Motor Company.

You will remember that some time ago Mr. Sprague made the statement in public that we would soon be in a position to throw an armature into a tank of salt water, leave it there for twenty-four hours, then take it out and run it. The statement was rather incredulously received at the time, but we have accomplished *this very fact.* An armature, after having been treated, was allowed to soak in a barrel of fresh water for twenty-four hours. Upon its removal it was measured and found to be sound. It was then put in a barrel containing a *strong saline* solution and allowed to remain for twenty-four hours. At the expiration of that time it was taken out and *immediately* put into a machine and run for two and a half hours on an *overload* averaging *about* 33⅓ *per cent.* The armature at the end of the run was as sound as when the experiment was begun. When fresh water is thrown on an armature, making 800 or 1,000 revolutions per minute, there is not much chance for the water to penetrate the armature or do any harm. When, however, the armature is entirely submerged for twenty-four hours at rest in a salt water bath, and no harm is done to it, it must be pretty thoroughly protected. The Sprague Company now have arrangements about completed by which this method of treating motors will be carried on on a large scale, and in future all of our street car motors will be treated in this way. It seems rather strange to think of an electric motor (that "delicate piece of mechanism which cannot be touched") being treated to a salt water bath; but if we are to make the adoption of electricity on street car lines a permanent success, we must meet and successfully overcome all conditions of service imposed on the motors, and one of these conditions is an occasional salt water or acidulated bath.

I am glad to have the opportunity of stating that we have *actually done* that which Mr. Sprague promised we would do.

S. D. GREENE.

NEW YORK CITY.

Special Correspondence.

NEW YORK NOTES.

OFFICE OF THE ELECTRICAL WORLD,
167-177 TIMES BUILDING, NEW YORK, May 6, 1889.

The Goubert Manufacturing Company and the Stratton Separator Company, have moved to 32 Cortlandt street.

Mr. C. D. Bernsee, representing the Eco watchman's clock, has moved from the Potter Building to Temple Court, where he is prepared to fill all orders for his specialty.

The Electric Construction and Supply Company, F. E. Kinsman, manager, have moved their offices to the Telephone Building at 18 Cortlandt street, where they will continue to take orders for electric lighting, house wiring and equipment, and their arc lights for incandescent direct and alternating current circuits.

The Hartford Dynamic Company have taken the main floor in the building Cortlandt and West streets, where Mr. Linnell will make his headquarters and be prepared to execute contracts for complete electric light, stationary power and railroad plants. The company are the selling agents for the Russell steam engines and boilers, United States rocking grate bars and the Racine oil engines, which run from 1 to 25 h. p.

The Cleveland Motor Company, Mr. Gethan, manager, have settled in the handsome new building, 241-243 Centre street. I took a look into their machine room the other day, and was pleased to see work going on actively on motors of all sizes. Their specialty is arc motors, and their factory is well equipped with machinery of the best makes and able to turn out motors up to the latest ideas of the times in every respect.

The Brown & Sharpe Mannfacturing Company, of Providence, R. I., have just issued their April catalogue and price-list, in the usual neat and convenient shape. This illustrated catalogue has now reached a size of 200 pages, and illustrates a remarkable variety of tools and apparatus in connection with which the concern has made its world-wide reputation. This catalogue should be in the hands of every concern using machinery. It fits the ordinary pocket and will be sent free to any address on application.

The India Rubber and Gutta Percha Insulating Company have just conferred a favor on the electrical community by publishing in neat, handy form three useful tables. One of these shows the relative dimensions of pure copper wire at 60 degrees Fahr., and another gives George B. Prescott, Jr.'s, table of dimensions and resistances of pure copper wire, calculated on the basis or Matthiessen's standard, and a third table, for which in this handy form we are indebted to Mr. Habirshaw, gives information as to the sizes, diameter of rubber insulation, etc., and net price of special india-rubber covered wires.

Cobb Vulcanite Wire.—The Cobb Vulcanite Wire Company of Wilmington, Del., are very busy, and Mr. Cobb was in town last week to look after business. Four Cobb wires are going in from Fourteenth to Fifty-ninth street on Broadway and four from Twenty-third to Fifty-ninth on Sixth avenue, making 16 miles in all. This work is being done by the Complete Electric Construction Company for the Brush Company. The Cobb Company are also sending 25 miles to Chicago for city lighting. Anticipating a call for wire, the company have now a stock on hand so that they can ship 50 miles at a moment's notice.

The Self-Winding Clock Company, Mr. A. C. Bedford, manager, now have their offices at Room 20, No. 26 Broadway. The company have terminated their arrangement with the American Manufacturing and Supply Company, and are continuing the business as before, supplying their clocks at wholesale and retail. They will also install them for public and private use, and guarantee them for one year. Their customers have been surprised at the length of time that a battery will run the clocks, as clocks which have been in use much over a year are still working satisfactorily without any attention, and promise to go on for a long time to come. The company have a large number of excellent testimonials from users of their clocks.

Chas. A. Schieren & Co., the well-known manufacturers of "electric," perforated belting, etc., have just issued a remarkably pretty and tasteful pamphlet on their establishment and their methods of manufacture. The house was established in 1868, and since that time has built up an enormous business, for the carrying on of which it now has, in addition to its New York office and its factory in Brooklyn, branch offices in Philadelphia, Boston and Chicago. The pamphlet in question is profusely illustrated, containing not only a number of large, well-drawn sketches, but several neat little vignettes. It is well written, and after its perusal one has a very full and good idea of the method pursued in the production of standard belting.

The Composite Cell.—The River & Rail Electric Light Company, of 45 Broadway, are using the Composite cell, made by the Composite Cell Company, of 35 Broadway, D. C. Hood, general manager. Mr. Main, of the River & Rail Company, speaks in the highest terms of the cell, of which he has about 100 in use for stationary and movable purposes. The Roberts-Brevoort Company, of 206 Broadway, are also using these cells for their primary batteries. The Bridgeport Brass Company, Bridgeport, Conn., have recently ordered a full outfit of Composite acid tanks, the material being at once valuable and cheap for making acid tanks in brass works. The Composite is, in fact, applicable to any purpose, in any shape, in connection with acid and acid cells.

The Downie Boiler Incrustation Preventive Company, who have lately moved to 91 Hudson street, are pushing their eucalyptus boiler fluid very actively. This preparation, it is claimed, will successfully remove all the scale from steam boilers, prevent its formation, and at the same time preserve the iron entirely from pitting and corroding. It has always been considered efficient in removing or preventing the formation of scale, whether carbonate of lime, sulphate of lime or carbonate of magnesia. The company publish a neat little pamphlet containing scores and scores of testimonials from users of the fluid in all parts of the world. I note, in running my eye over the long list, the Western Union Telegraph Company, the New York United States Illuminating Company, the Nyack Electric Lighting Company, the Los Angeles Electric Light Company, the Newport, R. I., Gas Light Company, etc.

W. T. H.

NEW ENGLAND NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
Room 8, Cook Building, cor. Franklin and Congress Sts.
BOSTON, May 4, 1889.

Mr. Peck, of the Thomson-Houston Company, has just returned from a short business trip to Canada.

Mr. F. E. Pettingell, of Pettingell, Andrews & Co., has returned from Chicago and has been welcomed back with due solemnity.

Mr. Geo. Cutter, Western Agent of Pettingell, Andrews & Co., accompanied Mr. Pettingell from Chicago and his reception at the Electric Club was a creditable effort on the part of the electrical elite of modern Athens.

Messrs. J. F. Morrison, A. J. Carr and D. E. Evans were in town a few days stopping at the Parker House. Mr. A. P. Seymour, superintendent of the Syracuse Electric Light and Power Company, Syracuse, N. Y., was in town recently.

The Thomson Electric Welding Company, at Lynn, contemplate an increase to the factory lately erected by them. They are overcrowded with orders, and work is being pushed with greatest energy in both their experimental and mechanical departments.

Bangor, Me., is rejoicing over the possession of an electric road. A few days ago the first car was run over the road, and everything proved satisfactory. Four handsomely equipped cars are already in service, and more will be added as the business of the road may demand.

Springfield, Mass., is alive to the fact that when the eyes of its pupils are to be used at night, the illumination of the school-room should be accomplished in a way that will be most grateful to the eye and best suited for ventilation. The new high school building will be lighted by electricity. Springfield is awake, let others follow.

Bangor, Me.—The Brush Electric Company is securing the contract for the 130 arc plant for the city of Bangor stipulated to complete the work in three months. This is pretty close work for the Spring, but the company put on a force of 40 men and expect to have the plant done within the time. They are under a money guarantee of $200 a week for every week after the three months are up.

Mr. J. F. Butterworth.—I was pleased to receive a call this week from Mr. J. F. Butterworth, of Manchester, England, who is now on his way home from Australia. Mr. Butterworth's arrival in England will complete a tour of the world. His accounts of the advanced state of electrical development in such cities as Sydney and Melbourne are interesting, and I was surprised to learn that even the electric street car is now in Australia in all its glory, giving eminent satisfaction. The Thomson-Houston and Elwell-Parker systems for the street railway are used.

Stocks in Boston.—The Boston Stock Exchange has established an unlisted securities department, and accepted the following among other securities: Thomson-Houston Electric Company, capital $1,000,000, seven per cent preferred stock and $3,000,000 common stock, par value of each $25; transfer office 620 Atlantic avenue, Boston. Westinghouse Electric Company, capital $5,000,000, par $50; transfer office Pittsburgh, Pa. Thomson-Houston Trust Securities, series C, capital $100,000, par $10; transfer office, 620 Atlantic avenue, Boston. Thomson-Houston International Electric Company, capital $150,000 preferred, $350,000 common, par of each $100; transfer office 620 Atlantic avenue, Boston. Lynn Gas and Electric Company, capital $400,000, of which $25,000 stock is in the treasury; transfer office, Lynn, Mass. Malden Electric Company, capital $100,000, par $100, bonds, $100,000, six per cent.; transfer agent C. W. Royce, 96 Summer street, Boston.

An Elevated Road for Boston.—The elevated road bill is still a target for amendments and modifications. The anxious faces of the promoters of different systems are familiar in the halls of legislation, and everything that can be cut and dried at this embryotic stage of affairs receives the incision and enjoys the evaporation that the Massachusetts lobby affords. Among some of the proposed amendments to the bill are that each mile of road must represent not less than $600,000 capital; the road cannot enter any public park of Boston; and the granting of location by the local authorities to be permissive instead of mandatory. Mr. Lovell, of Boston, has moved to add to the permission to use the Manhattan system the following: "Provided that said style of road is first approved as hereinafter provided." The entire matter is still under discussion.

Mr. Frank Ridlon.—I had hoped to avoid Mr. Ridlon this morning on my return from New York, but ran against him in one of the many Thomson-Houston offices. "You fellows may say I am dealing in tin roofing, junk, old iron, etc., but come over to my office, and you can look at my sales for the past fifteen days, both second-hand and otherwise." Despising the elevator, we descended to the ground floor at a rate that was almost dangerous. Besides the sale of a second-hand 45-light dynamo and one second-hand 50-light American machine, I noted the disposal of Baxter motors as follows: One 10 h. p. to the Kennebec *Journal;* one 2 h. p., Pope Manufacturing Company; one ½ h. p., Lamson House Service Company; one 6 h. p., H. H. Crowell, Lynn, Mass.; one 1 h. p., Kennebec Light and Heat Company; two ½ h. p., Attleboro Steam and Electric Company; one 1 h. p., Attleboro Steam Electric Company; one 2 h. p., R. H. Blodgett, printer; one 2 h. p., Edward S. Clark, city; one 2 h. p., Phœnix Electric Light and Coal Company, East Greenwich, R. I.; one 1 h. p., Cobb, Bates & Yerxa, Taunton, Mass.; one ½ h. p., E. W. Gross, Auburn, Me. Mr. Ridlon seems to have struck a popular chord in his novel enterprise, and success is upon him.

Boston Electric Roads.—It seems that the overhead system of electric roads in this city not only have come to stay, but to multiply and extend. I have recently noticed in suburban drives under what perfect control the cars are, and the excellent results as to high speed that are obtained when desired. A few horses regard the innovation with a curiosity that may sometimes be enthusiastic, though seldom disastrous; as a rule, horses are not at all frightened, even in the country.

In order to facilitate matters and not be under the necessity of changing systems on the same road, the West End Street Railway Company have been endeavoring to extend their overhead system into the heart of the city. The following is the result of these efforts expressed by the unanimous approval of the Board of Aldermen: Ordered, that consent and permission is hereby granted to the West End Street Railway Company, in addition to the rights now possessed by it, to establish, construct, maintain and use the overhead single trolley electric system of motive power, so called, in the operation of its cars in and on each and all of the streets, ways and squares of the city of Boston wherein and on which the tracks of said company are now located, and to construct, lay, maintain and use the poles, wires and appliances and such electrical appliances and apparatus, and to make the underground and surface alterations in and on said streets, ways and squares necessary for that purpose. All work of construction under this order, and all kinds of quality and material used and the height of all poles erected shall be satisfactory to the superintendent of streets and committee on paving. The poles shall be cylindrical in shape and painted before erected, and shall be removed when so directed by the board of aldermen after 60 days' notice. No poles shall be erected under this order until a plan showing the location of the same has first been filed by said West End Street Railway Company in the office of the superintendent of streets, and has been approved by him and said committee on paving.

This order shall be null and and void unless the same be accepted by said West End Street Railway Company, and notice of such acceptance filed with the city clerk within 30 days from the passage hereof. F. R. C.

WESTERN NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
44 Lakeside Building, Chicago, May 4, 1889.

Mr. Chas. D. Jenney, of the Indianapolis Jenney Company, was in town last week.

Mr. Geo. Cutter, the consulting electrician, of this city, has gone to Boston on a business trip.

Hastings, Neb.—A Westinghouse engine has been added to the electric light plant at Hastings, Neb.

Hastings, Neb., is going to have an incandescent electric lamp factory before the summer ends.

Bryan, O.—A new corporation is the Fountain City Electric Light Company, of Bryan, O. The capital stock is $30,000.

A Plant to be Sold.—At Circleville, O., the plant of the Edison Electric Illuminating Company has been ordered to be sold.

Mr. Harry Kinney, a very promising electrician, of Omaha, Neb., favored your Western correspondent with a visit last week.

The Dubuque, Ia., Electric Railway is certainly under full headway, as far as the construction is concerned. The sheriff's jury has begun to assess damages; the poles have arrived, and work is starting up.

A Twenty-year Franchise has been granted to an electric light company of Blue Springs, Neb., provided the plant is ready for operation Jan. 1, 1890.

Mr. F. E. Pettingell, of the electrical contracting firm of Pettingell & Andrews, of Boston, Mass., favored your correspondent with a visit this week.

A Franchise for Kansas City.—A franchise to run an electric railway in Kansas City has been granted to the Blue Valley street railway of that city.

Electric Railway for Laredo.—Rails and ties to build three miles of street railway at Laredo, Tex., have arrived. This company are to install electric motors on their cars.

Light in Titusville.—The streets of Titusville, Pa., were lighted for the first time on May 4 by electricity. The plant consists of 60 Van Depoele arc lights and is owned by the city.

Electric Railway for Plattsmouth.—The Street Car Company, at Plattsmouth, Neb., has been reorganized. It is laying a new track upon which it will soon put electric motors.

The Wisconsin Electric Company, of Milwaukee, is a new corporation. The capital stock is $10,000. The incorporators are Thomas R. Mercein, Bradley G. Schley and H. T. Boggis.

Another Topeka Electric Railway.—One of the proposed new enterprises for Topeka is an electric railway for the north side. This will probably be in operation by the first of next year.

City Lighting at Bloomington.—The new lighting plant at Bloomington, Ill., was started up the other evening. The lamps are of the Thomson-Houston pattern and are quite satisfactory.

The Franklin Electrical Company is a new Chicago corporation. The incorporators are E. E. Flora, Philo R. Hoy and Edwin J. Forze. They propose to deal in electrical supplies, and have a capital stock of $5,000.

The Monroe, La., Electric Light Company has, after many delays, got its plant into operating condition. The installation is one of the most complete in the South. The plant consists of 80 Van Depoele arc lights.

The New Arc and Incandescent Plant at Streator, Ill., which is operated by the People's Electric Light Company has been started up. There are in use 800 incandescents and 60 arc lights of the Van Depoele system.

Light in Tiffin, O.—April 20th was a great day for Tiffin, O. At sundown the city was lighted by electricity for the first time. Nearly all the citizens were on the street and the event was celebrated by all the bands in town.

The Riverside Motor Line, Wichita, Kan.—This line is to be entirely fitted up with new cars. The cars running at present are to go to a branch now being built.

The Contract for St. Joseph.—It will be remembered that the contract for lighting St. Joseph, Mo., was recently awarded to the Excelsior Electric Company. A special from that city states that the work of construction is about to begin.

A New Montana Corporation.—The Rock Fork Electric Company, of Rock Fork, Mont., is a new corporation. The capital stock has been set at $1,000,000. The company proposes to sell electrical apparatus and general electrical appliances.

Light for Helena.—The city of Helena, Montana Territory, is to be immediately lighted by electricity. The Thomson-Houston system is to be used. A 100 h. p. engine has been set up. The system will consist of 20 arc and 600 incandescent lights.

Improvements at Springfield, O.—The plant at Springfield is undergoing thorough repairs and extensive improvements. The building, as reconstructed, will have double its former floor space, and a 250 h. p. engine has been added to the machinery.

The Clinton Electric Light Company is making arrangements to double the present capacity for furnishing light. When the company was first organized a dynamo of 750 sixteen candle-power lamps was installed, and now another has been ordered.

Cincinnati, O.—Some citizens of Cincinnati are making considerable talk over the Mount Auburn line, in their city. This system will be the Sprague single trolley, and the telephone company claims that using the rail as return destroys the telephone service.

A New Plant for Decatur.—The present electric light companies of Decatur and New Decatur, Ala., have been bought out by a new electric light company, which will immediately build a new plant at a cost of $25,000. Pending its completion, the old plants will be used.

Mr. John R. Fletcher, superintendent of the Dayton Electric Light Works, has resigned from that position to accept a more lucrative one as traveling agent for an Eastern brass wire firm. Mr. Albert Thomas, electrician of the company, has been appointed to fill the vacancy.

Kansas City, Mo.—The directors of the new electric street-railway to be installed at Kansas City, recently made a tour of inspection over the proposed route. They propose running a belt line around two of the principal avenues, and will begin construction early in the summer.

An Electric Line for Fort Worth.—The directors of the Houston Street Railway Company, of Fort Worth, Tex., are laying a track, outside of their regular tracks, upon which to run a car with an electric motor as an experiment. If the experiment is successful the whole line will be so equipped.

The California Electrical Society of San Francisco, Cal., held a very interesting meeting recently. A paper was read by N. L. Jayne of the Sprague Electric Company, upon the subject of "Electric Motors and Electrical Transmission of Power." In the same city a recent incorporation is the Keith Electric Company.

Peoria, Ill.—At a meeting of those having charge of the Pekin, Bartonville & Peoria Electric Railroad held in Peoria this week the following officers were elected: Thomas Cooper, president; H. H. Cole, vice-president; J. N. Munson, general manager; E. W. Wilson, secretary; Geo. Grigg, Treasurer; A. B. Sawyer, Attorney.

The Portsmouth Gas Light Company's Proposal.—The Gas Light Company at Portsmouth, O., which also operates an electric light plant, propose to lease this plant to the city of Portsmouth for a term of three years to operate the city lighting. By the terms of the contract they will get $3,500 a year. There are 90 lights now in use.

The Superior Electric Light and Power Company, with a capital of $20,000, is a recent incorporation. The purpose of the company, as its name implies, is to furnish light and power to the city of Superior and to private subscribers. The incorporators are S. K. Felton, J. H. Kesterson, I. A. Shenden, Sidney Timmerman and C. A. Mosier.

Electric Light in Milwaukee.—In his message Mayor Brown, of Milwaukee, recommended that the street line between Flushing tunnel station and the water-works be lighted by electricity. In accordance with this recommendation the City Engineer has issued a letter to the various electric light companies, in which he asks for prices and ultimately bids.

An Electrical Brake Tested.—A trial was recently made of a new electrical brake in the presence of some of the Lake Shore & Michigan Southern officials. Motors set under the car were geared to the brakes and controlled by a dynamo on the locomotive. The test was claimed to be thoroughly successful, the action was certainly quicker and it is claimed that the cost is much less than the air brake now used.

Trial Trip at Elkhart.—The trial trip of the electric cars at Elkhart, Ind., was recently made with what might be called a modified success. The trolleys on top of the car were still stiff in the joints, and the connection between the car and the wire was occasionally broken. Wherever a complete circuit was obtained, however, the ultimate success of the line, when the trolleys shall have been properly oiled, was assured.

Omaha Successfully Lighted.—The new electric lights in Omaha, Neb., are working very well, using large incandescents on low iron mast arms. The experiment has only been recently tried in this city, however, and about one week ago the first lights were turned on. At that time only one dynamo was used, which was of 750-light capacity. Last Monday the boilers having been put in the 1,500 light dynamo was started.

More Phonograph Companies.—Articles of incorporation have been filed with the Secretary of State of Iowa for the South Dakota Phonograph Company, with the principal place of business at Rock Rapids, Ia. The object of this company is the sale and leasing of phonographs. Another of these is the Phonograph Company, of Nashville, Tenn. About three-quarters of the stock, or $65,000, has been taken. The object of this company is similar to that previously mentioned.

The Salt Lake City Road.—Readers of the Western notes in THE ELECTRICAL WORLD will doubtless remember that in a recent issue there appeared an item about the Salt Lake City Electric Railway. The cars ordered were to be equipped with the Sprague motors, and they have arrived. They were made by the John Stephenson Company, of New York, and are fine exhibitions of car building. The work of setting up is now going on, and it is expected that the cars will be running by the 1st of June.

Electrical Supplies in the Far West.—Readers of THE ELECTRICAL WORLD will doubtless remember that but a short time since, an item appeared in the Western column referring to the poor accommodation in the "far west" for electric light companies, owing to the difficulty of obtaining supplies quickly. This difficulty has now been obviated. The Sprague Electric Railway has opened a consignment office at Salt Lake City, where it will keep electrical supplies for shipment for the whole section west of the Rockies.

The Midland Electric Company, of Omaha, has suffered a loss in the resignation of its superintendent and electrician, Mr. Harry Kinney. This gentleman, in company with Mr. A. H. Zenner, a local electrician, has formed the Nebraska Electric Company, which proposes to do electrical contracting, and to deal generally in electrical supplies. Mr. Kinney states that, although they have not yet opened up their place, orders have come in by mail, and that the indications are that they will do a very successful business.

Electric Light in Baton Rouge.—The city of Baton Rouge, La., was lighted this week by electricity for the first time. The citizens celebrated the day of the opening of the plant by a street parade and other festivities. The streets will be lighted by 40 arcs and the business houses by 60 more. The residences of many of the citizens have been wired for incandescent lamps, of which 500 will be used. The system used is that of the Van Depoele Electric Manufacturing Company, of Chicago. The plant is owned by the Baton Rouge Electric Light Company.

An Electric Railway in Nashville.—The electric street cars which had been ordered for the line to be established in Nashville, Tenn., have just arrived at the latter city from Philadelphia where they were built. Each car is 16 feet long and 7 feet wide. They are very finely upholstered and all the metal mountings are of brass. There are six in all. Each of these cars cost $1,500. They represent the finest work of J. G. Brill & Co. The Thomson-Houston people furnish the motors. After this display of workmanship, an order was immediately placed by an electric road to be established in Chattanooga, for a duplicate outfit.

Lights at St. Louis.—Readers of THE ELECTRICAL WORLD will remember the notice of the award of the contract for lighting St. Louis. In connection with this contract Mr. Chas. Sutter has issued a circular from the office of the Sutter Electric Lighting Company, of that city, from which the following is abstracted: "Mr. Chas. Sutter having obtained the contract for lighting the City of St. Louis with 2260 arc lights of 2,000 candle-power each, has begun the erection of a 4,000 arc light plant with 6,000 horse power steam plant. The incandescent lights (accumulator system) enable consumers to have light at all times, whether the machinery is running or not. Light turned on Oct. 1, 1889."

Wichita, Kan.—The new plant of the Citizens Electric Light Company will certainly be one of the finest in the country. The new building is now nearly finished. It will be 100 feet square. It is divided in the centre by a wall which separates the dynamo room from the engine and boiler rooms. In the dynamo room will be placed thirteen dynamos, one for the Wichita and Suburban motor lines, and three for incandescent lighting. These latter three are of 650 lamps each. There will also be nine arc dynamos. This will make the total capacity of the plant 270 arcs and 1,950 incandescent lights. Six of the engines are already in, as are also three of the boilers and four of the dynamos. It is expected that by the first of the month the whole plant will be installed.

The Commercial Electric Company.—Mr. George E. Fisher, until recently manager of the Electrical Accumulator Company, of Detroit, and Mr. Wm. H. Fitzgerald, formerly general superintendent and manager of the Detroit Brush Electric Light Company, have resigned their respective positions, for the purpose of organizing and managing the Commercial Electric Company of that city, whose business will be to deal in general electrical supplies and to engage in electrical engineering and construction. They will open a large and centrally located store at 53 and 55 Gratiot avenue on May 10. They have secured several valuable agencies and contracts which will be announced later. Mr. Fitzgerald has been connected with the Brush Company, parent and local, for over ten years, and Mr. Fisher with the Electrical Accumulator and Lighting Company and the Electrical Accumulator Company, of Detroit, from date of organization up to the present time.

The Illinois Valley Electric Light and Power Company has been organized at Ottawa, Ill., to operate in the cities of Ottawa, Marseilles and Seneca, all located on the Illinois River. In view of the fact that the water-power privileges at Ottawa are controlled by rival companies, the promoters of the new enterprise were compelled to look elsewhere for a location. The next best point be-

ing Marseilles, it became necessary to select a system which could operate successfully at this distance. After some months of investigation, the company closed a contract with the Heisler Electric Light Company, of St. Louis, whose long distance system was found admirably suited for use under these conditions. Ottawa is located near the centre of LaSalle County and is eight miles from Marseilles. Seneca is near the county line and is three miles from Marseilles and thirteen miles from Ottawa. The amount of water-power available at Marseilles is practically unlimited. The plant now being installed will be of a capacity of about 700 30 c. p. lamps, but it will soon be increased to 2,000. It is expected that this capacity will be required for the public, commercial and domestic lights in three cities.

W. A. N.

THE TELEGRAPH.

Cochituate, Mass., wishes to put in an electric fire alarm system.

Arlington, Mass., is to put in a fire alarm system. Mr. C. Gott is chief of the fire department.

T. M. B. A.—Assessment No. 229, for $1, covers the death claims of J. H. Kilmore and N. D. Root.

Spokane Falls, W. T.—The Washington and Idaho Telegraph Company has been formed to operate a line running from Hope, I. T.

"Ticker" Time.—There has been trouble on Wall street on account of the difference in the "official time" sent out by the Gold & Stock and the Commercial tickers.

The Montreal Telegraph Company is making a fuss because it has not yet received its quarterly dividend, as per contract, from the Great Northwestern Company, due April 1. Notice of default has been served on the guarantors, the Western Union Company.

THE TELEPHONE.

The Telephone Convention at Minneapolis will begin on September 10.

Telephone Facilities for Cushing's Island.—It is probable that the near future will see the city of Portland, Me., connected by telephone with Cushing's Island, the noted summer resort. Such a line ought to prove a good investment, and certainly would be a great convenience.

THE ELECTRIC LIGHT.

Bainbridge, Ga., proposes to put in an Edison plant.

Blue Springs, Neb., is to have an electric light plant.

Topeka, Kan., boasts of no fewer than five electric plants.

Birmingham, Ala.—Electric lights are to be put in the Florence Hotel.

Berkeley, Cal.—The Berkeley trustees have voted to buy the electric light plant for $24,000.

Charleston, S. C.—The Charleston Cotton Mills have put in a plant of 1,000 Brush incandescents.

Wytheville, Va.—J. B. Barrett & Co. ask a franchise for an electric light plant and an electric road,

Alexandria, Va., has a proposition to secure a Schuyler plant of 60 arcs and 100 incandescents for $14,000.

Abilene, Kan.—The water and electric light company at Abilene is preparing to put in an arc light service.

Woonsocket, R. I.—The Brush Electric Company has sold a 90 arc plant to the Woonsocket Gas Company.

Tecumseh, Ga.—There is a talk of a Thomson-Houston electric light plant being established in Tecumseh, Ga.

Danbury, Conn.—The Merchants' Electric Light Company has been formed, and is applying for a charter.

Nelsonville, O.—The Nelsonville Electric Light Company has been incorporated with a capital stock of $25,000.

Keokuk, Ia.—The incandescent light was to be used for the first time in the opera house, Keokuk, Ia., May 1.

Pennsylvania.—Judge Simonton has decided that electric light companies are not manufacturing companies.

Shelbyville, Ind., talks of an electric light plant. The city clerk is Mr. H. C. Ray, who will furnish particulars.

Ellicott City, Md.—W. J. Dickey & Sons, of the Oella Cotton Mills, will probably put in a plant and light the town.

The Boston Brush Company has been dissolved, and ex-Mayor O'Brien has been appointed receiver to wind up its affairs.

Belleville, Ill.—The Belleville Electric Light and Power Company has completed its organization, and will apply to light the city.

Abingdon, Va.—The Abingdon Water-Works Company, T. P. Trigg, president, proposes to build and operate an electric light plant.

Griffin, Ga.—The Griffin Oil Mill Company, in which M. L. Bates and T. P. Bell are interested, will put in an electric light plant.

Pittston, Pa., has been discussing electric light bids, and will have incandescents instead of naphtha lamps. The matter is to be settled this week.

Portsmouth, O.—The Portsmouth Gas Company is ready to take over the city electric light plant and furnish the same number of arcs at $3,500 a year.

The Eclipse Wind Engine Company, of Beloit, Wis., are furnishing the Duluth Electric Light Company with a complete equipment of their clutch pulleys.

Adams, Mass.—The Massachusetts Gas Commissioners have under consideration the opposed petition of the Adams Gas Light Company to put in an electric light plant.

The Milwaukee Electric Light Company, of Chicago, capital $100,000, has been formed to furnish electric light and power. Incorporators, F. B. Uhrig, John Walsh and M. B. Austin.

Long Distance Incandescent Lighting.—It is stated that the Westinghouse alternating plant at Skowhegan, Me., is furnishing current to lamps at Norridgewock, six miles away.

Cadillac, Mich.—At a special meeting of the city council of Cadillac, Mich., the system of lighting proposed by the Cummer Electric Light Company was accepted. It will have 18 arcs.

Bellaire, O.—A charter has been granted to the Bellaire Gas and Electric Company, by W. Sinram, M. Booth, W. McMasters and others, with a capital stock of $150,000. A plant will soon be put in.

Americus, Ga.—The Americus Gas Light Company has become the Americus Light and Power Company. It will do an electric lighting business, and has increased its capital stock from $40,000 to $80,000.

Hartford, Conn.—It is stated that a sliver three-quarters of an inch long was recently drawn out of a man's finger at the Hartford Electric Light Company's station by the application of electricity.

Gloucester, Mass.—The new officers of the reorganized Gloucester Electric Light Company are: W. H. Jordan, president; J. O. Procter, vice-president; E. L. Norris, treasurer; M. Clough and E. J. Garfield, directors.

The Central Electric Light Company has ordered about $40,000 worth of machinery from the Jenney Electric Company, of Indianapolis, for their new Sedalia, Mo., plant. The streets of the city will be lighted with 120 arcs.

Livingston, Mont.—Mr. W. S. Jackson has sold a Thomson-Houston plant of 20 arcs and 600 incandescents, to be operated by a steam plant of 100 h. p. A local company has been formed comprising E. E. Stebbins and G. M. Hatch.

Louisville, Ky.—Mr. T. H. Fearey has recently sold Thomson-Houston incandescent plants of 200 lights to the Falls City Jeans and Woolen Mill, 500 lights to the Eclipse Woolen Mill and 150 lights to the Henderson, Ky., Woolen Mill.

The Central Thomson-Houston Company, of Cincinnati, O., has been incorporated under the laws of the State of Ohio, with a capital of $200,000, for the promotion and development of the Thomson-Houston system of electric lighting.

The Keith Electric Company, of San Francisco, has been formed by M. Nicholas, F. Romaine, G. W. Osborn, J. R. Pickens and S. M. Smith, with a capital stock of $1,000,000, to manufacture and introduce the Keith system of light and power.

Lynchburg, Va.—Dr. E. H. Murrell, of Washington, D. C., representing the Bowen Electric and Traction Company, will make efforts to organize a company to build an electric light plant, electric street railway and telegraph and telephone lines.

Cottage City, Mass.—The Cottage City Gas and Electric Light Company has bought up the local gas plant, and will also furnish electric light. New Bedford capital is represented. H. A. Holcomb is president; S. C. Hart, vice-president; and J. A. Brownell, secretary and treasurer.

Lynn, Mass.—The Thomson-Houston Electric Company has begun the erection of another large brick block, to accommodate its rapidly increasing business. One of the latest lights made by this company is the "search light," or naval projector, and the U. S. Government has already ordered quite a number of them, two of which will be placed on the man-of-war "Yorktown."

Hackensack, N. J.—Mr. G. W. Silsby, Edison agent, has recently closed a contract for an Edison central station at Hackensack, of a capacity of 200 municipal lamps of 30 c. p. for street use, and 750 lamps of 16 c. p. for domestic use. The company proposes to light Englewood, three miles distant, using the new Edison motor dynamo at Englewood, which will be the first installation of the kind.

Sault Ste. Marie, Can.—Some time since we published some special correspondence from Sault Ste. Marie as to the success with the Heisler incandescent system there. After some months of operation, the plant is now spoken of enthusiastically by the local papers, and in reply to a request last month, from another city, for information as to the value of the light, the mayor of the city telegraphed: "The Heisler gives complete satisfaction in every respect. I heartily commend its adoption as the most perfect electric light extant, and say this much after an extended visit to the United States and our own experience with it in this town."

Larned, Kan.—A local paper says: The electric light system in use in the city is under contract from Jan. 1, 1888, for ten years, and consists of twenty-six arc lights for which the city pays a rental of $2,000 per annum, payable quarterly on the first of April, July, October and January at the Kansas Fiscal Agency, New York. The system, so far as the city service is concerned, seems to be operating very satisfactorily, no complaints having been made during the past quarter. There are several points at which additional lights would be of great service, and the attention of the council is called to the matter. It is understood that the electric light plant is of sufficient power to furnish more arc lights if required.

Westinghouse Alternating Plants.—During the latter half of April the Westinghouse Electric Company received orders for alternating current outfits as follows: Jonesborough, Ark., 750 lights; Westerly, R. I., 500 lights; Newark, N. J., 750 lights; Ottawa, Kan., 750 lights; Ashland, N. H., 500 lights; Minneapolis, Minn., 600 lights (increase); Auburn, Me., 750 lights; Traverse City, Mich. 500 lights The total of orders for the month of April aggregates 15,850 16-c. p. lamps capacity. Total four months to April 30, 74,000 16-c. p. lamps capacity. About one-third of the central station companies using the Westinghouse system have increased their capacity since starting, in most cases at least doubling their original outfit.

Brush Plants in the South.—The following interesting item is from *Dixie:* "In the State of North Carolina within the last few months have been installed the following plants: W. H. Williams' new cotton factory, at Newton, 100 Brush incandescent lamps; Hickory, a joint stock company, 20 arc lamps and 125 incandescent lamps of the Brush patent; Statesville, on town account, 30 arc lamps and 150 incandescent lamps, Brush patent; Odell's factory, at Concord, 225 incandescent lamps, Brush Company; Charlotte, 45 arc lamps, Thomson-Houston Company; Sarson Bros., Charlotte, spoke and handle factory, 50 incandescent lamps, Brush Company; Henrietta Mills Company, on Carolina Central Railroad, near Rutherfordton, 225 incandescent lamps, Brush Company; H. F. Carpenter & Son's (Malden, N. C.) cotton mills, incandescent lamps, Brush Company; Randleman Manufacturing Company, Milledgeville, 450, and Naomi Falls Company, same place, 300 incandescent lamps, Brush Company; Winston, N. C., joint stock company ($75,000 capital), 45 arc and 430 incandescent lamps, Brush Company; Miller, Blanton & Co., Shelby, 75 incandescent lamps, Brush Company. All these are outside of Asheville, where there are burning 40 arc and about 1,500 incandescent lamps. Asheville has the only electric railway. These figures are amazing and go to prove that electricity is the light of the near future."

APPLICATIONS OF POWER.

Bangor, Me.—The electric road at Bangor began running on April 28.

Waltham, Mass.—The electric light company are starting a day power circuit.

Knoxville, Tenn.—Mr. G. W. Arthur is asking for estimates on five miles of electric railway to be built at once.

East Atlanta, Ga.—An electric railway is being constructed by the East Atlantic and Improvement Company. It will be two miles long.

Americus, Ga.—Electricity will be used for the motive power of the Americus street railway. The Thomson-Houston Company will establish a plant for the operation of the railway as well as the lighting of the city by electricity.

Topsham, Me.—An electric road is to be built by a new company, to run from the Fair grounds to the Maine Central station at Brunswick.

East Harrisburg, Pa.—The Thomson-Houston Company has received an order from the East Harrisburg Passenger Railway for one double motor truck equipped with two 15 h. p. motors.

Topeka, Kan.—An attempt was made at Topeka a few night ago to wreck one of the electric cars by means of a bomb placed along the track. The car was badly shaken up, but no one was injured. The bomb was found shattered in the dirt.

Electric Roads.—The number of electrical street railways in the United States, March 31, 1889, was 59, operating 440 motor cars over 309 miles of track. Nearly as many more roads are building, and upward of 50 new companies are being incorporated.

The American Motor Company filed articles of incorporation with the County Recorder of Belleville, Ill., last week, with a capital of $5,000,000. The incorporators are Thomas J. Christy, Francis G. Steward, Charles E. Carroll, Louis E. Frost and Fred H. Miller.

Naumkeag, Mass.—The Thomson-Houston Company has just contracted with the Naumkeag Street Railway Company, of Salem, Mass., to supply them with 6 motor trucks each equipped with two 15 h. p. motors. They will be used on the line from Salem to the Willows.

Boston, Mass.—The work of the Thomson-Houston Company on the new line of the Revere Street Railway is being rapidly pushed toward completion. The piles are all driven, the cross timbers put on, and the track nearly all in place. The line is double track, and will extend from Winthrop Junction to Crescent Beach, and may be continued beyond there on the tracks of the West End Street Railway Company, of Boston.

Electric Railway in India.—The *Indian Engineer* says that Col. Thomason, R. E., is busy surveying the country between Naini Tal and the plains at his own cost, with a view to the construction of an electric railway, for which he considers the available water power furnished by the lake, now running to waste, sufficient and to spare, and with which he proposes also irrigating a very fine site now lying idle for want of water.

The Williams Engine Works are to have a Shaw Electric traveling crane for their new shops at Beloit. It will have a span of 40 feet and be proportioned for a working load of 15 tons, but is to sustain a test load 50 per cent. in excess of this, or 22½ tons, without injury. It is being built by E. P. Allis & Co., of Milwaukee, who have had one of these cranes of 25 tons capacity in successful operation in their foundry for several months.

Sioux City, Ia.—Mr. J. S. Peavey, President of the Sioux City Street Railway Company, writes: "Our City Council has granted an extension of our franchise from the city to fifty years from this date, with the proviso that we equip our road with either electrical or cable power within the next three years, which, of course, we will do. We have not as yet definitely determined what system we will adopt, but it will be electricity, and probably we shall equip the line during the summer or early fall."

Decatur, Ill.—On April 24 the Talbot Paving Company, of Decatur, broke ground for the track of the Decatur Electric Street Railway. The road is built by Detroit and Louisville capital, and is intended to be a model in every respect. The Johnson girder rail will be used. The cars will be built by the Pullman Car Company, and the electrical apparatus by the Detroit Electrical Works. The power plant will consist of two 100 h. p. engines, built at Lansing, Mich. The franchise includes both power and lighting previleges. Mr. V. H. Parke is prominently interested.

PERSONALS.

Mr. A. L. Rohrer, of the Thomson-Houston Electric Company sailed for Europe on the German steamer "Fulda," last Saturday.

Capt. Eugene Griffin, U. S. A., manager of the Thomson Houston electric railway department gave a very interesting and able address on April 25, before the Boston Society of Arts.

Prof. Thomas H. Fearey, of the Vanderbilt University, Nashville, Tenn., has accepted a position with the Thomson-Houston Electric Company, as a representative in the South, and is already successfully at work.

Capt. Hugh R. Garden, of the Sawyer-Man Company, has presented to the New York Southern Society, for their new clubhouse in West Twenty-fifth street, a collection of 1,000 volumes relating to the history of the South.

Mr. F. McGowan, who was dispatched by Mr. Edison on a special mission to South America, has returned, after an absence of about a year and a half, bringing with him a large number of samples of new fibrous, materials, rubbers, etc. Mr. McGowan's adventures in the forests and wilds of South America were often exciting, and would fill a large and interesting volume.

Mr. C. J. Kintner has entered into a co-partnership with Dr. Leonard Paget as electrical and chemical experts and consulting electricians. It is stated that Dr. Paget has in the publisher's hands a book on "Dynamo Construction," dealing specially with alternating dynamos and motors, and that he is also preparing a book entitled "Graphic Arithmetic," directed particularly to the solution of electrical problems, that often go beyond the capability of ordinary methods.

Dr. Norvin Green, president of the Western Union Telegraph Company, walked up Broadway yesterday. He wore a high stovepipe hat, bright and shiny, and held in his mouth the butt of a fragrant Havana. He is very tall and stoops decidedly as he walks with slow and measured step. His name is much more familiar than his face to the people of the city and the world. His bearing is very gentle and courteous, with much of what is called the "old time," the "old school," about it.—*Joe Howard in the New York Press.*

MISCELLANEOUS NOTES.

San Francisco has, it is estimated by the local *Chronicle,* no fewer than 500 persons earning a livelihood in electrical occupations.

The Darche Electric Company, of Chicago, has been formed by G. C. Darche, E. T. Darche and G. D. B. Dods, with a capital stock of $10,000, to manufacture electrical appliances, etc., and to engage in electrical construction.

The National Railway Electric and Industrial Exposition Association, of St. Joseph, Mo., has been organized, with a capital stock of $1,000,000. The capitalists interested represent $30,000,000, and the articles call for the establishment of agencies in every State and Territory in the Union, and in foreign countries. They will erect an exposition building, which they claim will exceed in size any structure of the kind in the West.

The Crowdus Battery.—The Electric Fare Box Company, of

Nashville, Tenn., announce that by an improvement in their Crowdus battery, they now not only increase the life but guarantee an E.M.F. of 2.1 volts and an internal resistance of but 0.2 to 0.3 ohms. Mr. W. A. Crowdus, the general manager, reports that the demand has grown so greatly that they have been behind their orders for the last two months, it being appreciated that "this cell is remarkable for being the most powerful open circuit battery ever produced."

The Empire City Electric Company illustrated their usual enterprising spirit, as well as their patriotic zeal, in a very beautiful and unique manner last week. Both of their large show windows on Dey street were electrically illuminated. In one the figures "1779" were shown and "1889" in the other. Their entire building at No. 15 Dey street was also elegantly decorated and draped. This was all designed by their genial manager, Mr. H. G. Madden.

BUSINESS NOTICES.

Patterson, Jordan & Gottfried, 146-150 Centre street, carry a complete stock of brass and iron machine and wood screws, cap and set screws, all kinds of bolts, taps, files, twist drills, brass and rubber tubing, brush copper, rod and sheet copper, brass rod, sheet German silver, sheet brass, machinery, tools, hardware, etc. Electric motor supplies.

Electricity in Insanity.—Dr. W. T. Baird, of El Paso, writes March 18, 1889, to Jerome Kidder Manufacturing Company, 820 Broadway, New York, thus: "Mr. —— and his family are delighted with their battery; I am perfectly satisfied. I should be more than satisfied on another point in his case and that is this: At his home in —— he had been regarded as an *insane man*. His property had been taken out of his hands and he was placed under the care of a guardian, who sent him to the insane asylum at St. Joseph, Mo., and receiving no benefit there, he was placed under th care of Professor ——, in his asylum in St. Louis, and after over a year's treatment there, he was sent home incurable, when some friends prevailed on him to come to me, which he did, on the 1st of last September, and on the 1st of last December, after three months of electrical treatment, he was pronounced well. He s here yet and in the enjoyment of perfect health and his mind perfectly clear."

Chas. A. Schieren & Co., New York, are the patentees and sole manufacturers of the perforated electric leather belting. The perforations obviate air cushions; hence belts run slack with less strain on bearings, and without slip.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

PATENTS DATED APRIL 30, 1889.

402,157. Safety Railway Car; Charles Carroll Gilman, of Eldora, Ia. Application filed Nov. 5, 1887. In a car provided with an opening in its roof, a cover for said opening, and catches arranged for engaging and disengaging with said cover, in combination with an electric battery and connections for operating said catches.

402,165. Bell; Isaac Kinsey, of Cincinnati, Ohio, Assignor to the Standard Electrical Works, of same place. As an article of manufacture, a metallic bell plate formed integral with the bell post and having perforated tongues struck out of the interior thereof and bent upward from said plate to form the helix and armature supports, respectively, and tongues formed in the edge of said plate and bent upward therefrom to form lugs for holding a cover.

402,166. Galvanic Battery; William P. Kookogey, of Brooklyn, N. Y., Assignor to the Kookogey Electric Company. Application filed June 13, 1887. In combination with a box or shell, a lining formed of a single piece of sheet metal folded together, to fit the bottom and walls of the outer shell, and forming a water-tight lining without seam or joint.

(1) 402,190. Distribution of Electricity by Secondary Batteries. Application filed February 7, 1889. **(2) 402,191. System of Distribution by Secondary Batteries.** Application filed February 15, 1889. **(3) 402,192. Distribution of Electricity by Secondary Batteries.** Application filed February 18, 1889. For description of (3) see p. 273 this issue; (1) and (2) are modifications of (3).

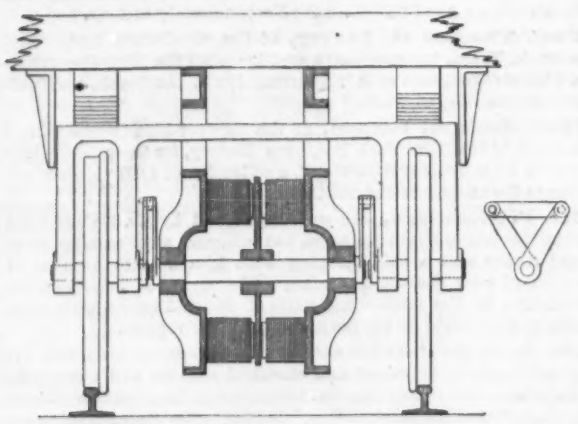
402,200. Pole-Piece for Dynamo-Electric Machines; John Grice Statter, of London, County of Middlesex, England; Application filed Feb. 9, 1888. Patented in England Feb. 23, 1887; in France, Feb. 13, 1888; in Belgium, Feb. 15, 1888, and in Spain, May 14, 1888. A dynamo-electric machine or motor, having one or more of its pole-pieces cut away or incised at a point intermediate of the extremities of said pole-pieces, to vary the length of the conductors acted upon and keep constant the magnetism generated in the coils passing under the brushes, whereby, when said brushes are shifted, sparking will be obviated. See illustration.

402,249. Electric Cut-Out; James L. Kimball and Herbert C. Wirt, of Boston, Mass. Application filed Jan. 10, 1889. A hollow base is provided with contact arms having their inner ends extended within the hollow base, and having their outer ends located outside the base and to which the line wires are secured.

402,264. Multiple Switch-Board, Charles E. McCluer, of Richmond, Va. Application filed Oct. 22, 1888. The combination, with a multiple switch-board and connected telephone lines, of a testing apparatus comprising a local circuit with a battery and rheotome, said local circuit passing through the primaries of the induction coils at each board, the terminals of the secondary of each induction coil being connected to the switch plugs of a flexible cord, with a testing plug grounded through a receiver.

402,290. Electric Motor; Frederick Yeiser, of Tampa, Florida. Application filed May 7, 1888. An electric motor comprising a series of coils, a shaft journaled eccentrically in the coils, a series of armatures arranged around the shaft at equidistant points, a corresponding series of cams carried by the said shaft, and circuit making and breaking levers adapted to be operated by the arm.

402,298. Combined Telephone and Telegraph System; William Burnley, of North East, Assignor of two-thirds to



402,311. ELECTRIC LOCOMOTIVE.

Charles A. Hitchcock and Samuel A. Davenport, of Erie, Pennsylvania. Application filed Jan. 30, 1888. In a combined telegraphic and telephonic system, the combination of undulatory current telegraphic transmitting instruments adapted to operate and maintain a continuous current over a main line, and telegraphic receiving instruments on said line, with telephonic transmitting and receiving instruments operating over said main line, and condensers between said telephonic instruments and said main line.

402,311. Electro Locomotive Engine; Sebastian Ziani De Ferranti, of Hamstead, County of Middlesex, England. Application filed Sept. 24, 1888. The combination, with the frame and driving wheels of an electric locomotive engine, of a dynamo electric machine placed between the driving wheels of the locomotive, with its armature concentric with the axle or axles of the wheels, and flexible couplings between the axle and armature which allow the frame of the locomotive and the dynamo which it carries to play up and down freely. See illustration.

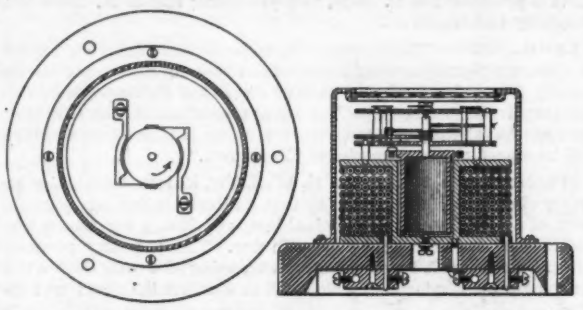
402,329. Electric Striking and Repeating Clock; Alphonse M. J. Jansen and Vincent J. A. M. Jansen, of San Willibrordo, Curaçoa. Application filed Oct. 9, 1888. The invention consists, in the combination, with an impulse wheel and pallets of a lever operated by an electro-magnet and adapted to propel the impulse wheel; also, in the combination with the time movement of a strike wheel connected with the time movement so as to be moved intermittently, the wheel being provided with electrical contacts for completing the bell circuit.

402,332. Electrical Gas Lighter; Daniel C. Knowlton, of Boston, Mass. Application filed Oct. 16, 1888. A gas burner and a cock controlling the passage of gas through the same, in combination with a lever attached to said cock and pivoted thereby in said burner, a pair of electrodes attached to said burner and said lever, a fixed pin, and a notched spring attached to said lever and engaging said pin, one of said notches being arranged to hold the cock open and the other to hold it closed by engaging with said pin.

402,349. Distribution of Electricity by Secondary Batteries; Matthias Pfatischer, of New York, N. Y., Assignor to the Electrical Accumulator Company, of New York. Application filed Nov. 2, 1888. The object of the invention is to maintain a constant difference of potential at the lamp terminals in the working circuits supplied by the battery, and to do this whether the dynamo is charging the battery or is disconnected therefrom. The improvement consists in apparatus for automatically introducing and withdrawing an artificial resistance by effects due to the presence or absence of the dynamo current.

402,367. Electric Belt; William L. Van Dorn, of Brooklyn, N. Y. Application filed March 5, 1889. An electric belt carrying a positive and negative electrode and a strip of cloth or flannel interposed between the same and saturated with a composition of water, capsicum, calcic chloride and oxide of zinc.

402,408. Railway Telegraph; Frank J. Crouch, of Oakland, Assignor of one-half to C. P. Houston, of Junction City, Ore. Application filed Jan. 21, 1887. In a system of railway telegraphy a central rail of insulating material located between the traffic rails of the road, having a continuous main conductor embedded therein, and sectional contact plates fixed on bevels formed on the upper edges of the rail, in combination with a roof or watershed over the top of the rail and partly extending over



402,410. METER FOR ALTERNATING CURRENTS.

the contact plates, and a longitudinally inclined slot in each side of the rail for preventing the moisture of the ground from reaching the contact rails.

402,410. Electric Meter for Alternating Currents; Delamore L. Davis, of Salem, O. Application filed Jan. 15, 1889. In an electric meter for alternating currents, the combination of an electro-magnet, an armature vibrating with the current alternations and having a connected friction plate, a disc subject to pressure from the friction plate and rotated by its vibrations, and an indicating mechanism actuated by the disc. See illustration.

(1) 402,414. (2) 402,415. Telegraphy; Mark W. Dewey, of Syracuse, N. Y., Assignor by direct and mesne assignments to the Dewey Corporation, of same place. Applications filed Oct. 3, 1888. In the art of reproducing written characters electro-telegraphically the method which consists in varying the strength of the line current formed of rapid impulses and causing such varying line current to actuate electro-magnetic devices to control the flow of ink or marking fluid of the receiving instrument.

402,416. Method of Expanding Hoops or Tires; Mark W. Dewey, of Syracuse, N. Y., Assignor by direct and mesne assignment to the Dewey Corporation, of same place. Application filed Feb. 11, 1889. The invention relates to a method or process of temporarily expanding, by electric heating, metallic hoops or tires preparatory to applying the same to a body to be encompassed and bound thereby.

402,420. Insulating Cut-Out Joint; Harry M. Doubleday and Russell Doubleday, of Pittsburg, Pa. Application filed Sept. 18, 1888. In combination with a gas fixture, an insulating sleeve interposed between two parts of the fixture to completely insulate them, said insulator having a broad lateral insulating flange formed integrally therewith, supporting the cut-out and other connectors for an electric lamp.

402,481. Incandescent Lamp Sockets; Frederick C. Rockwell, of Hartford, Conn. Application filed Jan. 24, 1889. A shell for incandescent electric lamp sockets, formed of paper, the surfaces of which are provided with a coating of insulating material of higher resistance than the paper.

402,484. Containing Cell for Secondary Batteries; Paul Schoop, of Zurich, Switzerland. Application filed Dec. 19, 1888. Patented in England Oct. 30, 1888, and in France Oct. 30, 1888. A rectangular cell-body for secondary batteries, provided on its inner sides and bottom with parallel notched side racks and parallel upwardly extending bottom racks.

402,491. Magnetic Pocket-Book; Benjamin F. Thomas, of Denver, Colorado. Application filed Dec. 27, 1888. A pocket-book provided with a flap, and a magnet secured in the flap; designed as a magnetic healing device.

402,506. Electric Signal; John T. Carter, of Baltimore, Maryland, Assignor of one-half to Frank J. Hilbert, of same place. Application filed January 22, 1889. The object of the invention is to provide an improved danger or caution signal wherein the trip located upon the track and operated by the passing train is connected with and actuates a circuit closer in a normally open circuit including a gong or other audible signal, which is sounded as the train approaches.

402,507. Duplex Fire-Alarm Telegraph; Sidney A. Chase, of Evart, Mich., Assignor of one-half to William R. Mapes, of same place. Application filed April 9, 1888. Has for its object, to provide a duplex system, in which the signals are sent from any outlying box or station to the central station by two different routes, and in such manner that at least two complete sets of signals are sent into said station for each complete revolution of the signaling wheel.

PATENTS EXPIRED MAY 7, 1889.

126,486. Improvement in Electric Telegraphic Apparatus; Frank L. Pope, of Elizabeth, N. J. The invention consists of a telegraphic transmitting key, of the form technically called a "strap-key," with a sounder having an electro-magnet and armature of peculiar construction.

126,505. Improvement in Clutch for Telegraph Transmitting and Paper-Feeding Apparatus; Gustavus C. Wessmann, of Brooklyn, N. Y. The combination of one or more clutches with the shaft that actuates the transmitter or circuit-breaker of a telegraphic instrument.

126,528. Improvements in Type-Wheels for Printing Telegraphs; Thomas A. Edison, of Newark, N. J., Assignor to Gold and Stock Telegraph Company, of New York City. Type-wheels, each connected to a disc, but allowed to move laterally in combination with sliding sleeves.

126,529. Improvement in Type-wheels for Printing-Telegraphs; Thomas A. Edison, of Newark, N. J., Assignor to the Gold and Stock Telegraph Company, of New York City. Type-wheels, each divided into sections and connected to a disc, in combination with sliding sleeves for expanding the wheel, or allowing of its being contracted.

126,530. Improvement in Printing Telegraphs; Thomas A. Edison, of Newark, N. J., Assignor to the Gold and Stock Company of New York City. An impression pad moved by a spring to give the impression when the current is broken in an electro-magnet, in combination with a type wheel.

126,531. Improvement in Printing Telegraphs; Thomas A. Edison, of Newark, N. J., Assignor to the Gold and Stock Telegraph Company of New York City. A lever is acted upon by lateral cores from the printing magnet, and this moves a bolt endwise, and the same is held by a latch.

126,532. Improvement in Printing Telegraphs; Thomas A. Edison, of Newark, N. J. Assignor to Gold and Stock Telegraph Company, of New York City. Relates to modifications in the construction and arrangement of the parts employed in the before named telegraph instruments, whereby the machine is rendered more compact.

126,533. Improvement in Printing Telegraphs; Thomas A. Edison, of Newark, N. J., Assignor to Gold and Stock Telegraph Company, of New York City. A type wheel and unison mechanism, in combination with a locking and unlocking mechanism for preventing or allowing an impression.

126,534. Improvement in Printing Telegraphs; Thomas A. Edison, of Newark, New Jersey, Assignor to Gold and Stock Telegraph Company, of New York City. Two type wheels, actuated by separate levers and step-by-step movements in combination with an actuating electro magnet, armature, and a bolt that locks either of the levers with the actuating armature.

126,535. Improvement in Printing Telegraphs; Thos. A. Edison, of Newark, N. J., Assignor to Gold and Stock Telegraph Company, of New York City. A unison stop actuated by a screw upon the type-wheel shaft.

PATENTS EXPIRED APRIL 30, 1889.

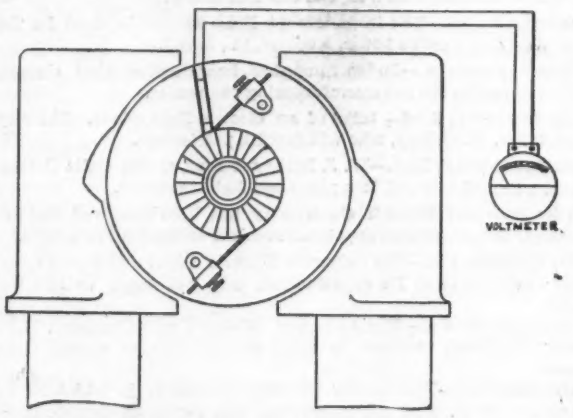
126,251. Improvement in Electric Torch for Lighting Gas; William W. Batchelder, of New York, N. Y. An electric torch for lighting gas complete in itself and independent of any connection whatever with the gas burner or fixtures thereof in generating and liberating the lighting spark.

126,263. Improvement in Electrical Alarm Apparatus for Bank Safes; William H. Butler and Dubois D. Parmelee, of New York. A fluid holding envelope or lining for safes, etc., constructed of glass.

126,287. Improvement in Electro-Magnetic Alarms; William B. Guernsey, of Jersey City, N. J. An electrical circuit, an alarm mechanism, and two or more synchronous mechanical circuit breakers or charges, or two or more automatic circuit breakers, the combined action of which are synchronous with another or others so combined that any interruptions or variation of the normal pulsations in the conductor will cause an alarm.

126,288. Improvements in Electro-Magnetic Burglar Alarms; William B. Guernsey, of Jersey City, N. J. A continuous conductor arranged to be broken by the opening of a door or window or other act, in combination with section wires, so connected with the battery as to afford a secondary connection from the instrument to each opening to be protected.

126,289. Improvement in Electrical Linings for Safes, Vaults, etc; William B. Guernsey, of Jersey City, N. J. Electrical conductors constituted of strips of metal of so slight cohe-



402,200. POLE PIECE FOR DYNAMO.

sion as to depend for their cohesion and continuity upon the base or support to which they are attached.

126,290. Improvement in Printing Telegraphs; William B. Guernsey, of Jersey City, N. J. Unison stops, controlled by automatic pole-changers.

126,329. Improvement in Printing Telegraphs; George M. Phelps, of Brooklyn, E. D., N. Y., Assignor to Western Union Telegraph Company. This invention consists in sending pulsations of alternate polarity over the main line to the receiving instrument, and there operating through electro-magnets and a polarized armature upon a lever, escapement and type-wheel.

126,336. Improvement in Printing Telegraphs; George B. Scott, of Brooklyn, N. Y., Assignor to himself and A. G. Davis, of Baltimore, Md. The combination of a circuit wheel and bank of keys, which are all in a closed circuit, except the one which is for the moment depressed, the arrangement of said keys and the wires which connect them with the circuit wheel being of such a nature that the circuit is broken when the circuit-breaker is midway between the projecting points or pins of the circuit wheel.

126,353. Improvement in Printing Telegraphs; Henry Van Hoevenberg, of Brooklyn, N. Y. An electro magnet and armature in which the armature is held to the cores by induced magnetism, except momentarily, when the polarity of the circuit is changed, in combination with a type-wheel and step-by-step movement and impression mechanism.

126,356. Improvement in Collecting Electricity for Telegraphing; William Henry Ward, of Auburn, N. Y. A tower constructed so as to collect, hold, distribute, and utilize aerial currents of natural electricity for telegraphic and other purposes.

Copies of the specifications and drawings complete of any of the patents mentioned in this record—or of any other patents issued since 1866—can be had for 25 cents. Give the date and number of patent desired, and address The W. J. Johnston Co. Ltd., Potter Building, N. Y.